THE

VOYAGE OF H.M.S. CHALLENGER.

ZOOLOGY—VOL. XIII.

REPORT

ON THE

SCIENTIFIC RESULTS

OF THE

VOYAGE OF H.M.S. CHALLENGER

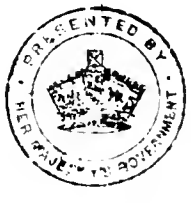
DURING THE YEARS 1873-76

UNDER THE COMMAND OF

CAPTAIN GEORGE S. NARES, R.N., F.R.S.

AND THE LATE

CAPTAIN FRANK TOURLE THOMSON, R.N.



PREPARED UNDER THE SUPERINTENDENCE OF

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AND NOW OF

JOHN MURRAY

ONE OF THE NATURALISTS OF THE EXPEDITION

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CONTENTS.

The Editor of the Challenger Reports will be greatly obliged to Authors sending him copies of separate papers, or references to works, in which the Challenger discoveries are referred to, or the observations of the Expedition are discussed.

This will greatly facilitate the compilation of a complete Bibliography, and the discussion of the results of the Expedition, in the final Volume of the Series.

Letters and Papers should be addressed—

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32 Queen Street,
EDINBURGH.

'S

CONTENTS.

ERRATA.

PART XXXV.

Page 9, line 3 from foot, for "*longicallis*" read "*longicallus.*"
Page 14, line 14 from foot, for "*Circe australis*, Angas" read "*Circe angasi*, n. sp."
Page 14, line 1 from foot, for "*Corbula truncata*" read "*Corbula tunicata.*"
Page 17, line 4 from foot, for "*Calodon elongata*" read "*Calodon elongatus.*"
Page 18, line 4 from foot, for "*Solen*" read "*Solecurtus.*"
Page 20, line 5 from foot, for "*Crytodon luzonica*" read "*Crytodon luzonicus.*"
Page 20, line 2 from foot, *insert* "(Chemnitz)" after "*Pecten vitreus.*"
Page 24, line 8 from foot, for "*Crytodon falklandica*" read "*Crytodon falklandicus.*"
Page 25, line 4 from foot, for "*Leda jeffreysii*" read "*Leda jeffreysi.*"
Page 25, line 3 from top, for "*Mactra* (*Trigonella*) *isabelliana*" read "*Mactra* (*Trigonella*) *isabelleana.*"
Page 121, line 19 from foot, for "*Dosina*" read "*Dosinia.*"
Page 251, line 4 from foot, *delete* "n. sp."
Page 282, line 5 from foot, for "*meridionalis*" read "*meridionale.*"

EDITORIAL NOTES.

This volume contains Parts XXXV., XXXVI., and XXXVII. of the Zoological Series of Reports on the Scientific Results of the Expedition.

Part XXXV.—On the return of the Expedition the Mollusca were placed in the hands of the Rev. R. Boog Watson, F.R.S.E., for description; but after separating out the different species, and labelling the greater part of the known ones, Mr. Watson determined, on account of the large size of the collection, to limit his work to the description of the Scaphopoda and Gasteropoda.

Mr. Edgar A. Smith, F.Z.S., of the British Museum was then requested to undertake the preparation of the Report on the Lamellibranchiata. This he consented to do, and this Part gives the result of his investigations.

Mr. Watson's own Report is now nearly all in type, and will be published in the course of a few months.

Part XXXVI.—The description of the Gephyrea collected by the Expedition was originally undertaken by Professor E. Ray Lankester, F.R.S., but after the publication of Professor Selenka's splendid systematic Monograph on this group, Professor Lankester suggested that it would be much better if an arrangement could be made by which Professor Selenka should take over the examination of the Challenger collection. Professor Selenka complied with a request to do so, and this Part gives the result of his labours.

The Report was translated from the German by J. Arthur Thomson, Esq., M.A.

Part XXXVII.—This Part consists of a Report on the Schizopoda of the Expedition, by the well-known Carcinologist, Professor G. O. Sars, of Christiania. In addition to the present Report, Professor Sars has undertaken another on the Cumacea and Phyllocarida, which will be published in the course of next year.

JOHN MURRAY.

CHALLENGER OFFICE, 32 QUEEN STREET,
EDINBURGH, *1st October* 1885.

THE

VOYAGE OF H.M.S. CHALLENGER.

ZOOLOGY.

REPORT on the LAMELLIBRANCHIATA collected by H.M.S. Challenger during the Years 1873–76. By EDGAR A. SMITH, F.Z.S., Assistant in the Zoological Department of the British Museum.

INTRODUCTION.

THE following Report upon the Lamellibranchiata obtained during the Challenger Expedition consists almost exclusively of a list of the various species comprised in the collection, with such remarks connected with each as were thought to be of sufficient interest for publication, and of the descriptions of the numerous forms which apparently are new to science. The time at my disposal for the preparation of the work having been rather limited, the revision of several of the genera, which in the course of studying some of the species has appeared desirable, has had to be abandoned. Only in a few instances has an account of the soft parts preserved in spirit been given, as these are to be placed in other hands for examination and anatomical description.

Before the collection was handed over to me it had already to a great extent been identified by the Rev. R. Boog Watson, who is reporting on the Scaphopoda and Gasteropoda of the Expedition, and it is with much pleasure that I bear testimony to the very great assistance I have derived from his labours.

In the first place, I escaped the great trouble of sorting the numerous species into separate boxes and bottles, and of writing the localities, depths, &c., upon them. This, however, is but a slight advantage in comparison with that of having the identifications of one whose powers of perception are second to those of no other conchologist of my acquaintance, and whose carefulness and thoroughness must have been recognised by

all fellow-workers, whom, in the course of the preparation of his Report, he may have consulted. This is also a fitting place to record the assistance I have derived from the late Dr. Gwyn Jeffrey's writings on the deep-sea fauna of the North Atlantic, and to acknowledge his courtesy in kindly giving his opinion upon certain difficult and doubtful questions. To my friend W. H. Dall, of the Smithsonian Institution, I am under similar obligations.

The name Pelecypoda given to this section of Mollusca by Goldfuss[1] ought, I think, to be used in preference to that of Lamellibranchiata. Not only has it priority, but, as pointed out by Stoliczka, it is also more in uniformity with the nomenclature of the other classes of Mollusca, the Cephalopoda, Pteropoda, Gasteropoda, &c., and points to the modification of one of the most important organs—that of locomotion—of the animals.

This class was designated Lamellibranches by Blainville[2] as early as the year 1816, four years before the publication of Pelecypoda by Goldfuss, but was not characterised, and the term Lamellibranchiata, accompanied by a description of the class, did not appear until the year 1824, in Blainville's article on Mollusca in the Dict. d. Sci. Nat., vol. xxxii. p. 306. It will therefore be seen that Pelecypoda, although published somewhat later than Lamellibranches, was in reality the first to be characterised. I should also here notice that Blainville imposed the name Tétrabranches upon the bivalves[3] two years before the invention of Lamellibranches, but, in that instance also, unaccompanied by any description. The class-names "Acéphala" of Cuvier and "Conchifera" of Lamarck were published a year or two prior to the appearance of Goldfuss's work, but, as they include groups which are regarded in modern science as distinct classes, their adoption is not advisable, seeing that Pelecypoda applies only to true bivalve Molluscs as now understood. The name Lamellibranchiata is used in the present Report as it appears in the several works published by Sir Wyville Thomson, Professor H. N. Moseley, and others in connection with the voyage of the Challenger, also in the Narrative of the Cruise, and because it had already been written on some of the plates before this subject of nomenclature had been studied.

In describing the new species I have deemed it advisable to give Latin diagnoses, as practical experience has proved to me the advantage of such descriptions, and the custom is adopted by continental writers almost without exception. Through long use the Latin terminology has acquired a settled signification, and is generally understood, which is not the case in respect of other languages, and the time has not yet arrived that any one particular modern language is universally so thoroughly known that its adoption as the language of science can be determined upon.

[1] Handbuch der Zoologie, 1820, vol. i. p. 599.
[2] *Bull. Soc. Philom. Paris*, 1816, p. 122; and *Journ. de Physique*, 1816, vol. lxxxiii. p. 255.
[3] *Bull. Soc. Philom. Paris*, 1814, p. 179.

GENERAL REMARKS ON THE COLLECTION.

I have already given a brief notice of the collection, which will be found incorporated in the Narrative of the Voyage,[1] and the views there expressed require little modification.

The collection, as a whole, is in some respects disappointing. Considering the character of the Expedition, the appliances with which it was furnished, the able staff of scientific men on board, and the number of Stations dredged, it certainly does seem surprising that only about five hundred species[2] should have been obtained. This, however, may not be three-fourths of the number of forms which actually passed into the dredge or trawl, for doubtless a certain proportion, perhaps a large percentage, of the secured material, and possibly some of the most valuable, must have found its way through the meshes of the network during the process of hauling in, especially from very great depths. Another disappointing feature of the collection is that the species are represented in the majority of instances by very few specimens, there being of many of them but single or a few odd valves, some of which are in a bad state of preservation. The greater part of the collection consists of species from comparatively shallow water, Torres Strait, the Arafura Sea, Port Jackson, Bass Strait, Fiji, Kerguelen and Marion Islands, supplying a large proportion.

As might be expected, some of the forms are of particular interest when great depths have been reached, but it is a remarkable fact that only one distinctly new generic type was discovered.[3]

The greatest depth at which Lamellibranchs were obtained was 2900 fathoms (Station 244, in Mid North Pacific). Of the two species from this enormous depth one is a small fragile shell which I have named *Callocardia pacifica;* I should here observe, and it is a most interesting fact, that a second species (*Callocardia atlantica*) was dredged in 1000 fathoms off the Azores, which is all but identical with that from the Pacific. A third species of this genus (*Callocardia adamsii*) was also obtained in very deep water in the Atlantic to the south-west of Sierra Leone. The second species, from Station 244, belongs to *Abra*, which I regard as a subgenus of *Semele*.

The other Stations, ranging from depths of 1000 to 2650 fathoms, at which Lamellibranchs were obtained are Nos. 45, 47, 56, 70, 71, 73, 78, 85, 98, 104, 106, 113, 133, 135E, 137, 146, 157, 158, 184, 198, 205, 216, 218, 244, 246, 271, 281, 300, 302, 317, 323, 325, and 348. I have quoted these numbers so that reference can be made to the

[1] Narr. Chall. Exp., vol. i. pp. 624–626, 1885.

[2] This does not include a small number of species represented only by odd valves, which are beyond identification owing to their young state or bad condition.

[3] A still more remarkable absence of generic novelties occurred in the case of the Brachiopoda, not a single new form having been described by Mr. Davidson.

List of Stations given further on, by those interested to know the actual species found in such deep water. I here merely make a few observations respecting the different genera there met with. At the above thirty-three Stations only twenty-three different genera were found, although the majority of these occurred in more than one place. The genera *Amussium* and *Arca* were met with at seven of the Stations; *Nucra* at five; *Lima* and *Callocardia* at four; *Malletia*, *Limopsis*, *Cryptodon*, *Abra*, *Lyonsiella*, and *Verticordia* at three; *Leda*, *Nucula*, *Pecten*, *Silenia*, and *Sarepta* at two; and *Modiolaria*, *Dacrydium*, *Pectunculus*, *Venus*, *Myrina*, and *Glomus* at one only.

Some of the species occurred in more than one locality, showing at times a very remarkable geographical distribution.

The following are some of the principal instances:—

Silenia sarsii, . . .	About 1100 miles south-west of Australia, in 1950 fathoms; also off the mouth of the Rio de la Plata, in 2650 fathoms.
Saxicava arctica, . . .	Cosmopolitan, 0 to 500 fathoms.
Semele (*Abra*) *profundorum*,	Near the Canary Islands, in 1125 fathoms, and Mid North Pacific, in 2900 fathoms.
Petricola lapicida, . . .	North Australia, in 7 fathoms; a well-known West Indian form.
Venus (*Chamelæa*) *mesodesma*,	New Zealand, on the beach, and off Tristan da Cunha, in 1000 fathoms.
Cardium sueziense, . .	A Red Sea species; from Fiji, in 12 fathoms.
Verticordia deshayesiana, .	Off Pernambuco, in 350 fathoms, and near Cape York, in 155 fathoms.
Kellia suborbicularis, . .	A British species; from Kerguelen Island, in 28 fathoms.
Astarte magellanica, . .	A Strait of Magellan species; from Marion Island.
Cardita calyculata, . .	Off Tenerife, in 70 fathoms, and in Bass Strait, in 38 to 40 fathoms.
Nuculina ovalis, . . .	A fossil of the Suffolk Crag; from the Cape of Good Hope, in 15 to 20 fathoms.
Sarepta abyssicola, . .	Mid North Pacific, in 2050 fathoms, and Mid South Pacific, in 2385 fathoms.
Limopsis pelagica. . .	Mid Atlantic, in 1850 fathoms. and off Japan, in 345 fathoms.
Arca imbricata, . . .	A West Indian species, from near Cape York, in 25 fathoms.
Arca (*Barbatia*) *pteroessa*, .	Mid North Pacific, in 2050 fathoms; west of the Azores, in 1000 and 1675 fathoms; and the West Indies, in 390 fathoms.

Arca (Barbatia) corpulenta, .	North-East Australia, in 1400 fathoms; south of Amboyna, in 200 to 360 fathoms; Mid Pacific, in 2425 fathoms; and near the Island of Juan Fernandez, in 1375 fathoms.
Mytilus edulis, . . .	Cosmopolitan.
Mytilus magellanicus, . .	Falkland Islands, Kerguelen Island, and Fiji, all in shallow water.
Modiolaria cuneata, . .	Port Jackson and the Cape of Good Hope, shallow water.
Lima squamosa, . . .	Tenerife, in 70 fathoms, and the Philippine Islands, in 10 fathoms.
Lima lata, ...	St. Paul's Rocks, Atlantic, in 104 fathoms, and Philippine Islands, in 82 fathoms.
Lima multicostata, . .	Port Jackson, in 2 to 18 fathoms; Tongatabu, in 18 fathoms; and off Bermuda, in 1075 fathoms.
Lima goliath, . . .	South Japan, in 775 fathoms, and South Patagonia, in 245 fathoms.
Lima loscombii, . . .	A British species; from the Azores, in 450 fathoms, and Tristan da Cunha, in 100 to 150 fathoms.
Pecten vitreus, . . .	West coast of Patagonia, in 140 to 400 fathoms; South Japan, in 345 fathoms; and Philippine Islands, in 100 to 700 fathoms.

A perusal of the above will show that some of the species were obtained not only at widely distant localities, but also at very different depths. *Venus mesodesma* (a shore species) was dredged in 1000 fathoms, *Arca pterocssa* in 390 and 2050 fathoms, *Lima multicostata* in 2 and 1075 fathoms, *Pecten vitreus* in 140 and 700 fathoms, *Nucra obesa* in 40 and 1000 fathoms, *Errilia castanea* in 70 and 1000 fathoms, and *Dacrydium vitreum* and *Pecten philippii*, both of which have been obtained in less than 40 fathoms, were hauled up respectively from 1000 and 450 fathoms. I might multiply examples of the different ranges in depth at which various species have been obtained by the Challenger and other expeditions, but those which I have cited are sufficient to show that the same species is equally well adapted for living in deep or shallow water, and, as far as I have noticed, the shells appear to be very little affected by the difference of the depth or the nature of the bottom.[1] As a rule, very deep-water "benthal" species certainly have a tendency to be without colour, and of thin structure, no doubt resulting from the absence of light, the difficulty of secreting lime, the scarcity of food, and other unfavourable conditions of existence.

[1] Mr. Davidson has also mentioned instances of Brachiopods "capable of existing at a great variety of depth," one species (*Terebratula vitrea*) ranging from 5 to 1456 fathoms. Zool. Chall. Exp., part i. p. 6, 1880.

But then most of them belong to genera the species of which from shallow depths are comparatively thin, and more or less devoid of colour. For instance, I may mention *Nearra*, *Lima*, *Cryptodon*, *Abra*, *Lyonsiella*, *Verticordia*, *Sarepta*, and *Dacrydium*. The deep-water species of such genera as have a decided epidermis (as *Malletia*, *Limopsis*, *Leda*, *Nucula*, and *Arca*) still retain it, with but little if any modification.

From a study of the Challenger collection it would therefore appear that the Lamellibranch fauna of the deepest parts of the Atlantic and Pacific Oceans is not of a very extraordinary, and certainly not of a special, character. The species are apparently few in number in comparison with those of shallow water, and new and peculiar generic forms which we naturally expected would have been discovered are of even still rarer occurrence.

In support of the theory that Molluscan life is comparatively scarce at great depths, I may give the following particulars. Species were obtained on forty-three occasions at depths of less than 100 fathoms, at twenty-four Stations at depths between 100 and 500 fathoms, at ten only in 500 to 1000 fathoms, and at thirty-three in 1000 to 2900 fathoms. At the different Stations of the first range, 384[1] species were collected, 148 at those of the second, 24 at those of the third, and 70 at those of the fourth, so that it will be seen that the average number of species per Station at the different ranges is as follows:—

At depths of	0 to 100	fathoms	9	species.
,,	100 to 500	,,	6·16	,,
,,	500 to 1000	,,	2·4	,,
,,	1000 to 2900	,,	2·12	,,

These figures therefore clearly show that the deeper the Challenger dredged the fewer were the species obtained.

Mr. Davidson, in his Report on the Brachiopoda of the Expedition, has arrived at a similar conclusion, for he observes that they "are more numerous both in species and individuals at depths of less than 500 fathoms," and that it is "apparent that Brachiopoda do not, as far as our experience goes, generally abound in depths exceeding 500 or 600 fathoms; for out of one hundred and twenty-five dredgings in depths of from 1 to 600 fathoms, Brachiopoda were brought up twenty-two or twenty-three times, while in depths varying from 600 to 2900 fathoms they were obtained about sixteen times."

[1] It should be remarked that a good many of the species were found at more than one Station, hence the total number of species here given from those four ranges greatly exceeds the actual number of different species in the collection.

GEOGRAPHICAL DISTRIBUTION.

The following is a complete list of the Stations at which bivalves were obtained. The exact latitude and longitude, the depth and the nature of the bottom, will be given in this place, but not under the "habitat" of each species, so that needless repetition will be avoided. Only the number of the Station is quoted in the body of the work, but the geographical position is given to save the reader the inconvenience of constantly referring back to the subjoined list.

Under each Station are also given the names of the species there obtained, which will be of use to those interested in the study of special faunas.

The order of the Stations follows the course of the voyage, and such localities as have no Station number assigned to them follow those numbered Stations to which they are most closely situated.

STATION II.—January 13, 1873; lat. 38° 10′ N., long. 9° 14′ W.; depth, 470 fathoms; bottom, green mud (off the west coast of Portugal).

Limopsis minuta, Philippi. | *Pecten sulcatus*, var.
Leda rectidorsata, Seguenza (?).

STATION VIII.—February 12, 1873; lat. 28° 3′ 15″ N., long. 17° 27′ W.; depth, 620 fathoms; bottom, volcanic mud (a little south of the Canary Islands).

Lyonsia formosa, Jeffreys.
Neæra teres, Jeffreys.
Montacuta pura, n. sp.
Cryptodon croulinensis, Jeffreys.
Limopsis minuta, Philippi.
Leda messanensis, Seguenza.

STATION 23.—March 15, 1873; lat. 18° 24′ N., long. 63° 28′ W.; depth, 450 fathoms; bottom, Pteropod ooze (off Sombrero Island, West Indies).

Neæra clavicula, Dall.
Neæra sp.
Cryptodon sp.
Limopsis aurita, Brocchi.
Lima (*Limatula*) *confusa*, n. sp.
Lima (*Limatula*) *laminifera*, n. sp.

STATION.—St. Thomas, West Indies; depth not stated.

Amussium cancellatum, n. sp.

STATION 24.—March 25, 1873; lat. 18° 38′ 30″ N., long. 65° 5′ 30″ W.; depth, 390 fathoms; bottom, Pteropod ooze (off Culebra Island, West Indies).

Verticordia woodii, n. sp.
Neæra consociata, n. sp.
Neæra sp.
Montacuta occidentalis, n. sp.
Cryptodon incrassatus, var.
Crassatella parva, C. B. Adams.
Idas dalli, n. sp.
Dacrydium occidentale, n. sp.
Arca (*Barbatia*) *pteroessa*, n. sp.
Arca (*Scapharca?*) *inæquiseulpta*, n. sp.
Arca (*Scapharca?*) *culebrensis*, n. sp.
Limopsis minuta, Philippi.
Nucula culebrensis, n. sp.
Leda decipiens, n. sp.
Leda inaudax, n. sp.
Leda hebes, n. sp.
Leda despecta, n. sp.
Malletia veneriformis, n. sp.
Malletia cuneata, n. sp.
Glomus jeffreysii, n. sp.
Glomus simplex, n. sp.
Glomus inæquilateralis, n. sp.
Glomus sp.
Pecten culebrensis, n. sp.
Pecten sp.
Pecten sp.
Amussium squamigerum, n. sp.
Amussium obliquum, n. sp.
Amussium cancellatum, n. sp.
Lima (*Limatula*) *laminifera*, n. sp.

STATION.—North Atlantic, deep water (probably off Bermuda).

Montacuta cylindracea, n. sp.
Lucina (*Codakia*) *tigrina*, Linné.

STATION 33.—April 4, 1873; lat. 32° 21′ 30″ N., long. 64° 35′ 55″ W.; depth, 435 fathoms; bottom, coral mud (off Bermuda).

Circe bermudensis, n. sp.
Ervilia subcancellata, n. sp.
Verticordia ornata, var.
Corbula philippii, n. sp.
Neæra consociata, n. sp.
Neæra clavicula, Dall.
Neæra congenita, n. sp.
Neæra curta, Jeffreys.
Lucina (*Codakia*) *pecten*, Lamarck.
Cryptodon barbata, Reeve (?).
Malletia veneriformis, n. sp.
Amussium dalli, n. sp.
Amussium squamigerum, n. sp.
Amussium cancellatum, n. sp.

STATION.—Bermuda, depth,——(?), probably shallow water.

Lithodomus antillarum, Philippi.
Lithodomus appendiculatus, Philippi.

STATION 36.—April 22, 1873; lat. 32° 7′ 25″ N., long. 65° 4′ W.; depth, 30 fathoms; bottom, coral (off Bermuda).

Arca noæ, Linné.
Arca (*Acar*) *domingensis*, Lamarck.
Avicula (*Meleagrina*) *squamulosa*, Lamarck.
Lima (*Mantellum*) *hians*, Gmelin.

STATION 45.—May 3, 1873; lat. 38° 34′ N., long. 72° 10′ W.; depth, 1240 fathoms; bottom, blue mud (off the east coast of the United States).

Malletia obtusa, Sars.

STATION 47.—May 7, 1873; lat. 41° 14′ N., long. 65° 45′ W.; depth, 1340 fathoms; bottom, blue mud (south of Nova Scotia).

Malletia obtusa, Sars.

STATION 56.—May 29, 1873; lat. 32° 8′ 45″ N., long. 64° 59′ 35″ W.; depth, 1075 fathoms; bottom, coral mud (off Bermuda).

Limopsis aurita, Brocchi. | *Amussium cancellatum*, n. sp.
Lima multicostata, Sowerby.

STATION 70.—June 26, 1873; lat. 38° 25′ N., long. 35° 50′ W.; depth, 1675 fathoms; bottom, Globigerina ooze (Mid North Atlantic, west of the Azores).

Verticordia tornata, Jeffreys. | *Modiolaria semigranata*, Reeve.
Leda excisa, Philippi.

STATION 71.—June 27, 1873; lat. 38° 18′ N., long. 34° 48′ W.; depth, 1675 fathoms; bottom, Globigerina ooze (a little east of Station 70).

Area (*Barbatia*) *pteroessa*, n. sp.

STATION 73.—June 30, 1873; at. 38° 30′ N., long. 31° 14′ W.; depth, 1000 fathoms; bottom, Pteropod ooze (a little west of the Azores).

Semele (*Abra*) *profundorum*, n. sp. | *Dacrydium vitreum*, Möller.
Callocardia (?) *atlantica*, n. sp. | *Area* (*Barbatia*) *pteroessa*, n. sp.
Neæra cincinata, Jeffreys. | *Limopsis aurita*, Brocchi.
Neæra wollastonii, n. sp. | *Amussium lucidum*, Jeffreys.

STATION 75.—July 2, 1873; lat. 38° 38′ N., long. 28° 28′ 30″ W.; depth, 450 fathoms: bottom, volcanic mud (off the Azores).

Circe minima, Montagu.
Venus (*Ventricola*) *casina*, Linné.
Venus (*Ventricola*) *effossa*, Bivona.
Venus (*Chione*) *ovata*, Pennant.
Tellina (——?) *donacina*, Linné.
Semele (*Abra*) *longicallis*, Scacchi.
Erycina castanea, Montagu.
Chama gryphoides, Linné.
Cardium (*Acanthocardium*) *papillosum*, Poli.
Cardium (*Papyridea*) *transversale*, Deshayes.
Saxicava arctica, Linné.
Nucula curta, Jeffreys.
Montacuta pura, n. sp.
Cryptodon flexuosus, Montagu.
Area tetragona, Poli.

STATION 75—*continued.*

Limopsis minuta, Philippi.
Leda messanensis, Seguenza.
Pecten pusio, Linné.
Pecten philippii, Récluz.
Pecten testæ, Bivona.
Pecten gibbus, Linné.
Lima (Mantellum) loscombii, Sowerby.

STATION 78.—July 10, 1873; lat. 37° 26′ N., long. 25° 13′ W.; depth, 1000 fathoms; bottom, volcanic mud (off the Azores).

Callocardia (?) atlantica, n. sp.
Neæra obesa, Lovén.
Neæra azorica, n. sp.
Cryptodon croulinensis, Jeffreys.
Dacrydium vitreum, Möller.
Nucula reticulata, Jeffreys.
Leda confinis, n. sp.
Leda jeffreysi, Hidalgo.
Amussium propinquum, n. sp.
Amussium lucidum, Jeffreys.
Lima (Limatula) subovata, Jeffreys.
Lima (Limatula) confusa, n. sp.

STATION.—Off Tenerife, Canary Islands; depth, 70 fathoms.

Cytherea (Callista) chione, Linné.
Circe minima, Montagu.
Venus (Ventricola) casina, Linné.
Venus (Ventricola) effossa, Bivona.
Venerupis irus, Linné.
Psammobia costulata, Turton.
Kellia castanea, Montagu.
Chama gryphoides, Linné.
Cardium (Acanthocardium) papillosum, Poli.
Cardium (Papyridea) transversale, Deshayes.
Gastrochæna dubia, Pennant.
Diplodonta apicalis, Philippi.
Astarte macandrewi, Smith.
Cardita calyculata, Linné.
Pectunculus stellatus, Bruguière.
Pecten pusio, Linné.
Pecten corallinoides, d'Orbigny.
Lima squamosa, Linné.

STATION 85.—July 19, 1873; lat. 28° 42′ N., long. 18° 6′ W.; depth, 1125 fathoms; bottom, volcanic mud (west of the Canary Islands).

Semele (Abra) profundorum, n. sp.
Verticordia quadrata, n. sp.
Neæra circinata, Jeffreys.

STATION.—St. Vincent, Cape Verde Islands; depth, 7 to 20 fathoms.

Venus (Anaitis) paphia, var.
Psammobia intermedia, Deshayes.
Cardium (Lavicardium) norvegicum, var.
Gastrochæna dubia, Pennant.
Lucina columbella, Lamarck.
Arca (Acar) domingensis, Lamarck.
Pectunculus formosus, Reeve.
Pecten corallinoides, d'Orbigny.

STATION 98.—August 14, 1873; lat. 9° 21′ N., long. 18° 28′ W.; depth, 1750 fathoms; bottom, Globigerina ooze (west of Sierra Leone, West Africa).

Semele (*Abra*) *profundorum*, n. sp. | *Nearra filocarinata*, n. sp.

STATION 104.—August 23, 1873; lat. 2° 25′ N., long. 20° 1′ W.; depth, 2500 fathoms; bottom, Globigerina ooze (Mid Atlantic, between Sierra Leone and North Brazil).

Lima (*Limatula*) sp.

STATION 106.—August 25, 1873; lat. 1° 47′ N., long. 24° 26′ W.; depth, 1850 fathoms; bottom, Globigerina ooze (somewhat west of Station 104).

Verticordia tornata, Jeffreys. | *Lyonsiella jeffreysii*, n. sp.

Limopsis pelagica, n. sp.

STATION 109.—August 28, 1873; lat. 0° 55′ 38″ N., long. 29° 22′ 35″ W.; depth, 104 fathoms; bottom, hard ground (off St. Paul's Rocks, Mid Atlantic).

Lima lata, n. sp.

STATION 113.—September 1, 1873; lat. 3° 40′ 45″ S., long. 32° 22′ W.; depth, 1010 fathoms; bottom, hard ground (off Fernando Noronha, north-east of Brazil).

Pectunculus pectinatus, Gmelin.

STATION 113A.—September 1, 1873; lat. 3° 47′ S.; long. 32° 24′ 30″ W.; depth, 25 fathoms; bottom, volcanic sand and gravel (anchorage of Fernando Noronha).

Erycina subcancellata, n. sp. | *Mytilus exustus* (Lamk.), Reeve.
Cardium (*Fragum*) *medium*, Linné. | *Arca imbricata*, Bruguière.
Lucina (*Codakia*) *pecten*, Lamarck. | *Pecten noronhensis*, n. sp.

STATION 120.—September 9, 1873; lat. 8° 37′ S., long. 34° 28′ W.; depth, 675 fathoms; bottom, red mud (off Pernambuco, Brazil).

Erycina subcancellata, n. sp. | *Leda solidula*, n. sp.
Nucula pernambucensis, n. sp. | *Amussium lucidum*, Jeffreys.

Lima (*Limatula*) *confusa*, n. sp.

STATION 122.—September 10, 1873; lat. 9° 5′ S., long. 34° 50′ W.; depth, 350 fathoms; bottom, red mud (a little south of Station 120).

Semele obliqua, jun. | *Verticordia woodii*, n. sp.
Semele (*Abra*) *braziliensis*, n. sp. | *Mytilus exustus* (Lamk.), Reeve.
Verticordia deshayesiana, Fischer. | *Leda semen*, n. sp.

Anomia ephippium, var.

STATION.—Bahia, Brazil; depth, 7 to 20 fathoms.

Cardium (*Papyridea*) *bullatum* (Linné ?), Chemnitz.

STATION 133.—October 11, 1873; lat. 35° 41′ S., long. 20° 55′ W.; depth, 1900 fathoms; bottom, Globigerina ooze (Mid South Atlantic).

Lyonsiella grandis, n. sp.

Cryptodon moseleyi, n. sp.

STATION.—Nightingale Island, Tristan da Cunha; depth, 100 to 150 fathoms.

Venus philomela, n. sp.
Saxicava arctica, Linné.
Diplodonta sp.
Carditella exulata, n. sp.
Pecten limatula, var.
Lima (*Mantellum*) *loscombii*, Sowerby.
Lima (*Limatula*) sp.
Anomia ephippium, var.

STATION 135E.—October 18, 1873; lat. 37° 21′ S., long. 12° 22′ 30″ W.; depth, 1000 fathoms; bottom, hard ground, shells, gravel (off Tristan da Cunha).

Venus (*Chamelæa*) *mesodesma*, Quoy and Gaimard.

STATION 137.—October 23, 1873; lat. 35° 59′ S., long. 1° 34′ E.; depth, 2550 fathoms; bottom, red clay (Mid South Atlantic, between Tristan da Cunha and Cape of Good Hope).

Malletia pallida, n. sp.

STATION.—Off the Cape of Good Hope; depth, 15 to 20 fathoms.

Tellina (*Angulus*) *natalensis*, Krauss.
Cardium (*Papyridea*) *semisulcatum*, Gray.
Cardita (*Thecalia*) *concamerata*, Chemnitz.
Carditella capensis, n. sp.
Nuculina ovalis, Searles Wood.

STATION 141.—December 17, 1873; lat. 34° 41′ S., long. 18° 36′ E.; depth, 98 fathoms: bottom, green sand (off the Cape of Good Hope).

Saxicava arctica, Linné.

Pecten limatula, var.

STATION 142.—December 18, 1873; lat. 35° 4′ S., long. 18° 37′ E.; depth, 150 fathoms; bottom, green sand (off the Cape of Good Hope).

Saxicava arctica, Linné.

Neæra capensis, n. sp.

STATION.—Off Marion and Prince Edward Islands in the Southern Ocean, south-east of the Cape of Good Hope; depth, 50 to 300 fathoms.

Davila umbonata, n. sp.
Thracia meridionalis, n. sp.
Saxicava arctica, Linné.
Neæra fragilissima, n. sp.
Cryptodon marionensis, n. sp.
Astarte magellanica, n. sp.
Mytilus meridionalis, n. sp.
Crenella marionensis, n. sp.
Modiolarca trapezina, Lamarck.
Dacrydium meridionale, n. sp.
Limopsis marionensis, n. sp.
Pecten distinctus, n. sp.
Pecten aviculoides, n. sp.
Lima (*Limatula*) *pygmæa*, Philippi.

STATION 146.—December 29, 1873; lat. 46° 46′ S., long. 45° 31′ E.; depth, 1375 fathoms; bottom, Globigerina ooze (Mid Southern Ocean).

Pecten pudicus, n. sp.
Amussium meridionale, n. sp.

STATION.—Kerguelen Island; depth, shore to 120 fathoms; bottom, volcanic mud.

Davila (?) *umbonata*, n. sp.
Anatina elliptica, jun.
Thracia meridionalis, n. sp.
Neæra kerguelensis, n. sp.
Kellia suborbicularis, Montagu.
Kellia cardiformis, n. sp.
Kellia nuculina, Martens.
Cardita astartoides, Martens.
Mytilus kerguelensis, n. sp.
Mytilus magellanicus, Chemnitz.
Modiolarca trapezina, Lamarck.
Modiolarca kerguelensis, n. sp.
Yoldia isonota, Martens.
Yoldia subæquilateralis, Smith.
Malletia gigantea, Smith.
Pecten clathratus, Martens.
Lima (*Limatula*) *pygmæa*, Philippi.

STATION 150.—February 2, 1874; lat. 52° 4′ S., long. 71° 22′ E.; depth, 150 fathoms; bottom, coarse gravel (south-east of Kerguelen Island).

Saxicava arctica, Linné.
Cardita astartoides, Martens.
Mytilus meridionalis, n. sp.
Limopsis straminea, n. sp.

STATION 157.—March 3, 1874; lat. 53° 55′ S., long. 108° 35′ E.; depth, 1950 fathoms; bottom, Diatom ooze (Mid Ocean, south-west of Australia).

Lyonsiella papyracea, n. sp.
Silenia sarsii, n. sp.
Neæra meridionalis, n. sp.

STATION 158.—March 7, 1874; lat. 50° 1′ S., long. 123° 4′ E.; depth, 1800 fathoms; bottom, Globigerina ooze (somewhat north-east of preceding Station).

Amussium meridionale, n. sp.

STATION 161.—April 1, 1874; lat. 38° 22′ 30″ S., long. 144° 36′ 30″ E.; depth, 33 fathoms; bottom, sand (off the entrance to Port Philip, South Australia).

Cardium (Bucardium) pulchellum, Gray.
Leda crassa, Hinds.
Leda ensicula, Angas.

STATION 162.—April 2, 1874; lat. 39° 10′ 30″ S., long. 146° 37′ E.; depth, 38 fathoms; bottom, sand and shells (off East Monœœur Island, Bass Strait).

Cytherea (Callista) rutila, Sowerby.
Venus (Chione) striatissima, Sowerby.
Thracia watsoni, n. sp.
Thracia myadoroides, n. sp.
Myochama anomioides, Stutchbury.
Cardium (Bucardium) pulchellum, Gray.
Kellia rotunda, var.
Cardita calyculata, var.
Cardita dilecta, n. sp.
Cardita beddomei, n. sp.
Cardita bimaculata, Deshayes.
Crassatella aurora, A. Adams and Angas.
Trigonia margaritacea, Lamarck.
Arca (Barbatia) radula, A. Adams.
Pectunculus beddomei, n. sp.
Limopsis bassi, n. sp.
Pinna tasmanica, Ten. Woods (?).
Pecten asperrimus, Lamarck.
Pecten undulatus, Sowerby.
Lima (Limatula) bullata, Born.

STATION.—Port Jackson, Sydney; depth, shallow water, 2 to 35 fathoms.

Dosinia circinaria, Deshayes.
Cytherea (Callista) disrupta, Sowerby.
Circe scripta, Linné.
Circe australis, Angas.
Venus (Chione) calophylla, Philippi.
Venus (Chione) jacksonii, n. sp.
Venus (Chione) striatissima, Sowerby.
Venus (Lenkoma) australis, Sowerby.
Tapes (Paratapes) textrix, Chemnitz.
Tapes (Amygdala) fabagella, Deshayes.
Psammobia zonalis, Lamarck.
Saxicava arctica, Linné.
Solen sloanii, Gray.
Corbula truncata, Hinds.
Neæra brazieri, n. sp.
Kellia rotunda, var.
Kellia adamsi, Angas.
Montacuta angasi, n. sp.
Lucina ramsayi, n. sp.
Lucina (Loripes?) jacksonensis, n. sp.
Diplodonta sp.
Cardita sp.
Psammobia modesta, Deshayes.
Tellina (—— ?) semitorta, Sowerby.
Donax nitidus, Deshayes.
Mactra (Trigonella) pusilla, A. Adams.
Mactra (Trigonella) jacksonensis, n. sp.
Mactra (Mactrinula) depressa, Reeve.
Erycina biscalpta, Gould.

STATION.—Port Jackson, Sydney—*continued.*

Chama spinosa, Broderip.
Thracia modesta, Angas.
Myodora pandoriformis, Stutchbury.
Myodora brevis, Sowerby.
Myodora crassa, Stutchbury.
Myodora australis, Reeve.
Myodora angustata, Angas.
Myochama anomioides, Stutchbury.
Cardium (Bucardium) tenuicostatum, Lamarck.
Cardium (Bucardium) pulchellum, Gray.
Cardita excavata, Deshayes.
Carditella angasi, n. sp.
Mytilus hirsutus, Lamarck.
Modiola glaberrima, Dunker.
Modiolaria laniger, Dunker.
Modiolaria cumingiana, Dunker.
Modiolaria varicosa, Gould.
Modiolaria cuneata, Gould.
Trigonia lamarckii, Gray.
Arca (Barbatia) fasciata, Reeve.
Arca (Scapharca) gubernaculum, Reeve.
Pectunculus holosericus, Reeve.
Pectunculus striatularis, Lamarck(?).
Limopsis brazieri, Angas.
Pecten (Janira) fumatus, Reeve.
Lima multicostata, Sowerby.
Lima angulata, Sowerby.
Lima (Limatula) bullata, Born.

STATION 164.—June 12, 1874; lat. 34° 8′ S., long. 152° E.; depth, 950 fathoms; bottom, green mud (off the coast of New South Wales).

Leda inopinata, n. sp.
Leda ramsayi, n. sp.

STATION 164B.—June 13, 1874; lat. 34° 13′ S., long. 151° 38′ E.; depth, 410 fathoms; bottom, green mud (off the coast of New South Wales).

Neæra angasi, n. sp.

STATION 167A.—June 27, 1874; lat. 41° 4′ S., long. 174° 19′ E.; depth, 10 fathoms; bottom, mud (Queen Charlotte Sound, New Zealand).

Dosinia lambata, Gould.
Cytherea (Callista) multistriata, Sowerby.
Psammobia lineolata, Gray.
Tellina (Tellinella) charlottæ, n. sp.
Tellina (Tellinella) huttoni, n. sp.
Nucula nitidula, A. Adams.

STATION.—D'Urville Island, New Zealand; shore.

Venus (Chamelæa) mesodesma, Quoy and Gaimard.
Tapes (Amygdala) intermedia, Quoy and Gaimard.
Mytilus edulis, Linné.

STATION 169.—July 10, 1874; lat. 37° 34′ S., long. 179° 22′ E.; depth, 700 fathoms; bottom, blue mud (off the north-east coast of New Zealand).

Limopsis lata, n. sp.

STATION 171.—July 15, 1874; lat. 28° 33′ S., long. 177° 50′ W.; depth, 600 fathoms; bottom, hard ground (north of the Kermadec Islands).

Pecten kermadecensis, n. sp.

STATION 172.—July 22, 1874; lat. 20° 58′ S., long. 175° 9′ W.; depth, 18 fathoms; bottom, coral mud (off Tongatabu).

Venus (*Antigona*) *puerpera*, var.
Circe amica, n. sp.
Psammobia pulcherrima, Deshayes.
Psammobia castrensis, Spengler.
Tellina (*Tellinella*) *verrucosa*, Hanley.
Chama brassica, Reeve.
Cardium (*Fragum*) *fornicatum*, Sowerby.
Corbula modesta, Hinds.
Lucina (*Codakia*) *interrupta*, Lamarck.
Pecten amicus, n. sp.
Lima multicostata, Sowerby.

STATION.—Fiji Islands; depth, 0 to 12 fathoms.

Cytherea (*Dione*) *philippinarum*, Hanley.
Circe sulcata, Gray.
Circe gordoni, n. sp.
Venus (*Chione*) *marica*, Linné.
Venus (*Chione*) *levukensis*, n. sp.
Tellina (*Angulus*) *valtonis*, Hanley.
Tellina (*Arcopagia*) *pretiosa*, Deshayes.
Tellina (—— ?) *rhomboides*, Quoy and Gaimard.
Tellina (—— ?) *tenuilirata*, Sowerby.
Tellina (—— ?) *fijiensis*, Sowerby.
Tellina (—— ?) *semen*, Hanley.
Cardium (*Acanthocardium*) *suezi-ense*, Issel.
Cardium (*Bucardium*) *australe*, Sowerby.
Lucina (*Codakia*) *levukana*, n. sp.
Lucina (*Codakia*) *fijiensis*, n. sp.
Lucina (*Loripes* ?) *gordoni*, n. sp.
Cryptodon rufolineata, n. sp.
Mytilus magellanicus, Chemnitz.
Septifer bilocularis, Linné.
Arca (*Barbatia*) *fusca*, Bruguière.
Leda micans, A. Adams.
Lima (*Ctenoides*) *tenera*, Chemnitz.

STATION 184.—August 29, 1874; lat. 12° 8′ S., long. 145° 10′ E.; depth, 1400 fathoms; bottom, Globigerina ooze (east of Cape York, North Australia).

Teredo sp.
Myrina coppingeri, n. sp.
Arca (*Barbatia*) *corpulenta*, n. sp.
Pecten murrayi, n. sp.

STATION 185.—August 31, 1874; lat. 11° 35′ 25″ S., long. 144° 2′ E.; depth, 135 fathoms; bottom, coral sand (east of Cape York, North Australia).

Tellina (—— ?) *diluta*, n. sp.
Semele (*Abra*) *regularis*, n. sp.
Verticordia deshayesiana, Fischer.
Verticordia australiensis, n. sp.
Neæra fallax, n. sp.
Poromya australis, n. sp.
Poromya lævis, n. sp.
Nucula torresi, n. sp.
Leda watsoni, n. sp.
Leda neæriformis, n. sp.

STATION 185B.—August 31, 1874; lat. 11° 38′ 15″ S., long. 143° 59′ 38″ E.; depth, 155 fathoms; bottom, coral sand (east of Cape York, North Australia).

Tellina murrayi, n. sp.
Montacuta acuminata, n. sp.
Lucina cristata, n. sp.
Lucina (*Codakia*) *congenita*, n. sp.
Limopsis torresi, n. sp.
Amussium torresi, n. sp.

STATION 186.—September 8, 1874; lat. 10° 30′ S., long. 142° 18′ E.; depth, 8 fathoms; bottom, coral mud (Cape York).

Circe obliquissima, n. sp.
Venus (*Chione*) *foliacea*, Philippi.
Chama jukesii, Reeve.
Tridacna crocea, Lamarck.
Gastrochæna lamellosa, Deshayes.
Corbula monilis, Hinds.
Mytilus (*Stavelia*) *horridus*, Dunker.
Lithodomus malaccanus, Reeve.
Arca (*Barbatia*) *lima*, Reeve.
Limopsis cancellata, Reeve.
Avicula macroptera, Lamarck.
Spondylus zonalis, Lamarck.
Lima (*Limatula*) *torresiana*, n. sp.

STATION.—Cape York, in 3 to 12 fathoms.

Circe fastigiata, Sowerby.
Psammobia anomala, Deshayes.
Tellina (*Angulus?*) *rhomboides*, Quoy and Gaimard.
Mactra (*Mactrinula*) *plicataria*, Linné.
Cardium (*Fragum*) *imbricatum*, Sowerby.
Lucina (*Divaricella*) *irpex*, n. sp.
Mytilus sulcatus, Lamarck.
Trigonia uniophora, Gray.
Arca navicularis, Bruguière.
Limopsis cancellata, Reeve.
Malleus albus, Lamarck.
Avicula (*Meleagrina*) *smaragdina*, Reeve.

STATION.—Flinders Passage, north of Cape York; depth, 7 fathoms.

Dosinia histrio, Gmelin.
Petricola lapicida, jun.
Tellina (——?) *tenuilirata*, Sowerby.
Tellina (——?) *languida*, n. sp.
Tellina (——?) *semen*, Hanley.
Semele infans, n. sp.
Myodora trigona, Reeve.
Myodora sp.
Mya sp.
Cælodon elongata, Carpenter.
Diplodonta subglobosa, n. sp.
Diplodonta conspicua, n. sp.
Limopsis cancellata, Reeve.

STATION.—Torres Strait ; depth, 3 to 11 fathoms.

Dosinia sculpta, Hanley.
Cytherea (*Caryatis*) *coxeni*, Smith.
Cytherea (*Caryatis*) *regularis*, n. sp.
Circe scripta, Linné.
Venus (*Antigona*) *lamellaris*, Schumacher.
Clementia papyracea, Gray.
Tellina (*Arcopagia*) *elegantissima*, n. sp.
Tellina (—— ?) *casta*, Hanley.
Tellina (—— ?) *languida*, n. sp.
Claragella torresi, n. sp.
Corbula crassa, var.
Corbula scaphoides, Hinds.
Diplodonta conspicua, n. sp.
Arca (*Scapharca*) *clathrata*, Reeve.
Arca (*Trisis*) *semitorta*, Lamarck.
Nucula obliqua, Lamarck.

STATION 187.—September 9, 1874 ; lat. 10° 36′ S., long. 141° 55′ E.; depth, 6 fathoms ; bottom, coral mud (Torres Strait).

Dosinia deshayesii, A. Adams.
Dosinia histrio, Gmelin.
Venus torresiana, Smith.
Venus (*Chione*) *foliacea*, Philippi.
Venus (*Chione*) *calophylla*, Philippi.
Venus (*Chione*) *infans*, n. sp.
Venus (*Gomphina*) *undulosa*, Lamarck.
Tellina compacta, n. sp.
Tellina (—— ?) *semen*, Hanley.
Donax nitidus, Deshayes.
Chama sulphurea, Reeve.
Myodora, sp. (also Station 188).
Corbula monilis, Hinds.
Diplodonta scalpta, n. sp.
Diplodonta corpulenta, n. sp.
Diplodonta subglobosa, n. sp.
Diplodonta conspicua, n. sp.
Crassatella rhomboides, n. sp.
Arca imbricata, Bruguière.
Avicula (*Meleagrina*) *muricata*, Reeve.

STATION 188.—September 10, 1874 ; lat. 9° 59′ S., long. 139° 42′ E.; depth, 28 fathoms ; bottom, green mud (south of New Guinea).

Cytherea (*Caryatis*) *regularis*, n. sp.
Circe australis, Sowerby.
Circe gibbia, Lamarck.
Circe jucunda, n. sp.
Venus (*Chione*) *foliacea*, Philippi.
Venus (*Chione*) *lionota*, n. sp.
Venus (*Chione*) *infans*, n. sp.
Tapes (*Paratapes*) *semirugata*, Philippi.
Psammobia pallida, Deshayes.
Tellina (—— ?) *tenuilamellata*, n. sp.
Myodora sp. (also Station 187).
Cardium (*Bucardium*) *multispinosum*, Sowerby.
Cardium (*Fragum*) *torresi*, n. sp.
Solen (*Azor*) *coarctatus*, Gmelin.
Corbula macgillivrayi, n. sp.
Corbula monilis, Hinds.
Montacuta paula, A. Adams.

STATION 188—*continued.*

Lucina (Codakia) seminula, Gould.
Lucina (Codakia) pisum, Reeve.
Lucina (Loripes) desiderata, n. sp.
Diplodonta corpulenta, n. sp.
Diplodonta conspicua, n. sp.
Cardita insignis, n. sp.
Carditella torresi, n. sp.
Carditella infans, n. sp.
Crassatella rhomboides, n. sp.
Crassatella torresi, n. sp.
Trigonia uniophora, Gray.
Pectunculus vitreus, Lamarck.
Limopsis cancellata, Reeve.
Nucula obliqua, Lamarck.
Leda nova-guinensis, n. sp.
Leda corbuloides, n. sp.
Spondylus victoriæ, Sowerby.
Amussium pleuronectes, Linné.
Amussium scitulum, n. sp.
Ostrea imbricata, Lamarck.

STATION 189.—September 11, 1874; lat. 9° 36′ S., long. 137° 50′ E.; depth, 25 fathoms; bottom, green mud (Arafura Sea).

Dosinia histrio, Gmelin.
Dosinia mira, n. sp.
Tapes (Paratapes) undulata, Born.
Tellina (Angulus) lux, Hanley.
Semele amabilis, A. Adams.
Cardium (Bucardium) multispinosum, Sowerby.
Nevra elegans, Hinds.
Corbula tunicata, Hinds.
Trigonia uniophora, Gray.
Area (Scapharca?) consociata, n. sp.
Leda lata, Hinds.

STATION 190.—September 12, 1874; lat. 8° 56′ S., long. 136° 5′ E.; depth, 49 fathoms; bottom, green mud (Arafura Sea).

Tellina (Macoma) arafurensis, n. sp.
Martesia striata, Linné.

STATION 191.—September 23, 1874; lat. 5° 41′ S., long. 134° 4′ 30″ E.; depth, 800 fathoms; green mud (near the Arrou Islands).

Modiola watsoni, n. sp.
Nucula sp.
Malletia arruana, n. sp.

STATION.—Banda Islands; depth, shallow water.

Cytherea (Dione) philippinarum, Hanley.
Mactra (Trigonella decora), jun.

STATION 194.—September 29, 1874; lat. 4° 34′ S., long. 129° 57′ 30″ E.; depth, 200 fathoms; bottom, volcanic mud (south of the Molucca Islands).

Area (Barbatia) corpulenta, n. sp.

Station.—Amboina, Moluccа Islands; depth, 15 to 20 fathoms.

Venus (*Chione*) *lionota*, var.
Tapes (*Paremhola*) *obscurata*, Deshayes.
Psammobia sp.
Tellina (*Angulus*) *vernalis*, Hanley.
Tellina (*Macoma*) *consociata*, n. sp.
Semele (*Theora*) *iridescens*, Hinds.
Corbula tunicata, Hinds.
Corbula modesta, Hinds.
Lucina (*Codakia*) sp. jun.
Cryptodon bullula, Reeve.
Diplodonta amboinensis, n. sp.
Area (*Barbatia*) *sculptilis*, Reeve.
Area (*Scapharca*) *clathrata*, Reeve.
Plicatula sp.

Station 198.—October 20, 1874; lat. 2° 55′ N., long. 124° 53′ E.; depth, 2150 fathoms; bottom, blue mud (off the north-east point of Celebes).

Area (*Barbatia*) *corpulenta*, n. sp.

Station 201.—October 26, 1874; lat. 7° 3′ N., long. 121° 48′ E.; depth, 82 fathoms; bottom, stones, gravel (off the west coast of Mindanao, Philippine Islands).

Venus (*Chione*) *mindanensis*, n. sp.
Area (*Acar*) *congenita*, n. sp.
Lima lata, n. sp.

Station.—Off Samboangan, Philippine Islands; depth, 10 fathoms.

Perna samoensis, Baird.
Pecten lemniscatus, Reeve (?).

Station 203.—October 31, 1874; lat. 11° 6′ N., long. 123° 9′ E.; depth, 20 fathoms; bottom, mud.

Venus (*Chione*) *calophylla*, Philippi.
Cardium (*Bucardium*) *mirabile*, Deshayes.
Pecten senatorius, var.
Amussium pleuronectes, Linné.

Station 204.—November 2, 1874; lat. 12° 28′ N., long. 122° 15′ E.; depth, 705 fathoms; bottom, green mud (off the west coast of Luzon, Philippine Islands).

Pecten vitreus, Chemnitz.

Station 205.—November 13, 1874; lat. 16° 42′ N., long. 119° 22′ E.; depth, 1050 fathoms; bottom, blue mud (same as preceding Station).

Cryptodon luzonica, n. sp.

Station 207.—January 16, 1875; lat. 12° 21′ N., long. 122° 15′ E.; depth, 700 fathoms; bottom, blue mud (west of the Island of Luzon).

Modiola watsoni, n. sp.
Pecten vitreus, n. sp.
Amussium caducum, n. sp.

STATION 208.—January 17, 1875; lat. 11° 37′ N., long. 123° 31′ E.; depth, 18 fathoms; bottom, blue mud (same as Station 204).

Chama carditaformis, Reeve.
Anatina siphonata, Reeve.
Cardium (*Bucardium*) *tenuicostatum*, Lamarck.
Cardium (*Bucardium*) *australe*, Sowerby.
Diplodonta subgranulosa, n. sp.
Arca (*Barbatia*) *lima*, Reeve.
Pecten leopardus (var. *solaris*).
Pecten senatorius, var.

STATION 209.—January 22, 1875; lat. 10° 14′ N., long. 123° 54′ E.; depth, 95 fathoms; bottom, blue mud (east of the Island of Panay, Philippines).

Pecten vitreus, Chemnitz.

STATION 210.—January 25, 1875; lat. 9° 26′ N., long. 123° 45′ E.; depth, 375 fathoms; bottom, blue mud (same position as Station 209).

Semele (*Abra*) *philippinensis*, n. sp.
Amussium jeffreysii, n. sp.

STATION 212.—January 30, 1875; lat. 6° 54′ N., long. 122° 18′ E.; depth, 10 fathoms; bottom, sand (south of the Island of Mindanao).

Cytherea (*Callista*) *lilacina*, Lamarck.
Cytherea (*Callista*) *roseotincta*, n. sp.
Cytherea (*Caryatis*) *hebræa*, Lamarck.
Circe sulcata, Gray.
Venus (*Chione*) *recognita*, n. sp.
Mactra (*Trigonella*) *incarnata*, Deshayes.
Cardium setosum, Redfield.
Cardita canaliculata, Reeve.
Arca (*Scapharca*) *angicostata*, Reeve.
Pectunculus striatularis, Lamarck (?).
Lima squamosa, Lamarck.

STATION 216.—February 16, 1875; lat. 2° 46′ N., long. 133° 58′ E.; depth, 1675 fathoms; bottom, Globigerina ooze (north-west of New Guinea).

Arca (*Barbatia*) *corpulenta*, n. sp.

STATION 218.—March 1, 1875; lat. 2° 23′ S., long. 144° 4′ E.; depth, 1070 fathoms; bottom, blue mud (north of New Guinea).

Amussium watsoni, n. sp.

STATION 219.—March 10, 1875; lat. 1° 54′ S., long. 146° 39′ 40″ E.; depth, 150 fathoms; bottom, coral mud (a little north-east of Station 218).

Cryptodon watsoni, n. sp.

Station.—Admiralty Islands; depth, 16 to 25 fathoms.

Mactra (*Trigonella*) *achatina*, Chemnitz.

Mactra (*Trigonella*) *incerta*, n. sp.

Station 232.—May 12, 1875; lat. 35° 11′ N., long. 139° 28′ E.; depth, 345 fathoms; bottom, green mud (Gulf of Yedo, Japan).

Limopsis pelagica, n. sp.

Nucula niponica, n. sp.

Yoldia lischkei, n. sp.

Pecten vitreus, Chemnitz.

Station.—Off Yokohama, Japan; depth, 8 to 14 fathoms.

Raeta pulchella, A. Adams and Reeve.

Station 233a.—May 10, 1875; lat. 34° 38′ N., long. 135° 1′ E.; depth, 50 fathoms; bottom, sand (between the islands of Sikok and Nipon, Japan).

Venus (*Chione*) *scabra*, Hanley.

Tapes (*Chione*) *undulata*, Born.

Modiola barbata, Linné.

Arca (*Macrodon*) *dalli*, n. sp.

Nucula (*Acila*) *mirabilis*, Adams and Reeve.

Pecten (*Janira*) *laqueatus*, Sowerby.

Anomia laqueata, var.

Station 233c.—May 28, 1875; lat. 34° 18′ N., long. 133° 21′ E.; depth, 12 fathoms; bottom, blue mud (same as preceding Station).

Raeta pulchella, Adams and Reeve.

Station 236.—June 5, 1875; lat. 34° 58′ N., long. 139° 29′ E.; depth, 775 fathoms; bottom, green mud (south-east of Nipon, Japan).

Lima goliath, Sowerby.

Station 244.—June 28, 1875; lat. 35° 22′ N., long. 169° 53′ E.; depth, 2900 fathoms; bottom, red clay (Mid North Pacific Ocean).

Semele (*Abra*) *profundorum*, n. sp.

Callocardia (?) *pacifica*, n. sp.

Station 246.—July 2, 1875; lat. 36° 10′ N., long 178° E.; depth, 2050 fathoms; bottom, Globigerina ooze (Mid North Pacific Ocean).

Arca (*Barbatia*) *pterocesta*, n. sp.

Nucula profundorum, n. sp.

Sarepta abyssicola, n. sp.

Station.—Honolulu, Sandwich Islands (off the reefs in 40 fathoms).

Circe jucunda, n. sp.

Ervilia sandwichensis, n. sp.

Lucina (*Codakia*) *hawaiensis*, n. sp.

Julia exquisita, Gould.

STATION.—Honolulu; depth?

Ervilia biseulpta, Gould. | *Perna samoensis*, Baird.

STATION.—Hilo, Sandwich Islands; depth?

Perna vitrea, Reeve.

STATION 271.—September 6, 1875; lat. 0° 33′ S., long. 151° 34′ W.; depth, 2425 fathoms; bottom, Globigerina ooze (Mid Pacific Ocean).

Area (*Barbatia*) *corpulenta*, n. sp.

STATION.—Tahiti; depth, 20 to 40 fathoms.

Cytherea (*Dione*) *philippinarum*, Hanley. | *Lima tahitensis*, n. sp.

STATION 281.—October 6, 1875; lat. 22° 21′ S., long. 150° 17′ W.; depth, 2385 fathoms; bottom, red clay (Mid South Pacific Ocean, south of Tahiti).

Sarepta abyssicola, n. sp.

STATION 300.—December 17, 1875; lat. 33° 42′ S., long. 78° 18′ W.; depth, 1375 fathoms; bottom, Globigerina ooze (a little north-east of Juan Fernandez).

Area (*Barbatia*) *corpulenta*, n. sp.

STATION 302.—December 28, 1875; lat. 42° 43′ S., long. 82° 11′ W.; depth, 1450 fathoms; bottom, Globigerina ooze (about 600 miles west of Chili).

Amussium meridionale, n. sp.

STATION 305.—January 1, 1876, lat. 47° 47′ S., long. 74° 47′ W.; depth, 165 fathoms; bottom, blue mud (off the west coast of Patagonia).

Neaera patagonica, n. sp.

STATION 307.—January 4, 1876; lat. 49° 24′ 30″ S., long. 74° 23′ 30″ W.; depth, 140 fathoms; bottom, blue mud (off the west coast of Patagonia).

Pecten vitreus, Chemnitz.

STATION 308.—January 5, 1876; lat. 50° 8′ 30″ S., long. 74° 41′ W.; depth, 175 fathoms; bottom, blue mud (same as Station 307).

Pecten vitreus, Chemnitz.

STATION 310.—January 10, 1876; lat. 51° 27′ 30″ S., long. 74° 3′ W.; depth, 400 fathoms; bottom, blue mud (off the west coast of Patagonia).

Pecten vitreus, Chemnitz.
Pecten subhyalinus, n. sp.

STATION 311.—January 11, 1876; lat. 52° 45′ 30″ S., long. 73° 46′ W.; depth, 245 fathoms; bottom, blue mud (off west coast of Southern Patagonia).

Saxicava arctica, Linné.
Solemya patagonica, n. sp.
Lucina lamellata, Smith.
Modiolarca trapezina, Lamarck.
Pecten vitreus, Chemnitz.
Lima goliath, Sowerby.

STATION 312.—January 13, 1876; lat. 53° 37′ 30″ S., long. 70° 56′ W.; depth, 9 fathoms; bottom, blue mud (Strait of Magellan).

Pecten patagonicus, King.

STATION 313.—January 20, 1876; lat. 52° 20′ S., long. 67° 39′ W.; depth, 55 fathoms; bottom, sand (east of the entrance to the Strait of Magellan).

Saxicava arctica, Linné.

STATION 315.—January 26, 1876; lat. 51° 40′ S., long. 57° 50′ W.; depth, 12 fathoms (off the Falkland Islands).

Mytilus edulis, Linné.
Mytilus magellanicus, Chemnitz.
Modiolarca trapezina, Lamarck.
Pecten patagonicus, King.

STATION 316.—February 3, 1876; lat. 51° 32′ S., long. 58° 6′ W.; depth, 4 fathoms; bottom, mud (off the Falkland Islands).

Venus (*Katelysia*) *exalbida*, Chemnitz.
Cryptodon falklandica, n. sp.

STATION 317.—February 8, 1876; lat. 48° 37′ S., long. 55° 17′ W.; depth, 1035 fathoms; bottom, hard ground (gravel) (north of the Falkland Islands).

Lima (*Limatula*) sp.

STATION 320.—February 14, 1876; lat. 37° 17′ S., long. 53° 52′ W.; depth, 600 fathoms; bottom, green sand (off the coast of La Plata).

Neæra platensis, n. sp.

STATION 321.—February 25, 1876; lat. 35° 2′ S., long. 55° 15′ W.; depth, 13 fathoms; bottom, mud (mouth of the Rio de la Plata).

Cytherea (*Callistis*) *rostrata*, Koch
Tellina (*Macoma*) *uruguayensis*, n. sp.
Mactra (*Trigonella*) *isabelliana*, d'Orbigny.
Periploma compressa, d'Orbigny.
Nucula uruguayensis, Smith.

STATION 322.—February 26, 1876; lat. 35° 20′ S., long. 53° 42′ W.; depth, 21 fathoms; bottom, sand, shells (off the mouth of the Rio de la Plata).

Mytilus edulis, Linné.
Plicatula ramosa, Lamarck.

STATION 323.—February 28, 1876; lat. 35° 39′ S., long. 50° 47′ W.; depth, 1900 fathoms; bottom, blue mud (east of the preceding Station).

Glomus nitens, Jeffreys.

STATION 325.—March 2, 1876; lat. 36° 44′ S., long. 46° 16′ W.; depth, 2650 fathoms; bottom, blue mud (farther east than Station 323).

Silenia sarsii, n. sp.

STATION 344.—April 3, 1876; lat. 7° 54′ 20″ S., long. 14° 28′ 20″ W.; depth, 420 fathoms; bottom, volcanic sand (off Ascension Island).

Cryptodon sp.
Leda jeffreysii, Hidalgo.

STATION 348.—April 9, 1876; lat. 3° 10′ N., long. 14° 51′ W.; depth, (2450) fathoms; bottom, Globigerina ooze (south of Sierra Leone).

Callocardia (?) *adamsii*, n. sp.

DESCRIPTIONS OF SPECIES.

Order LAMELLIBRANCHIATA.

Family Pholadidæ.

Subfamily Teredininæ.

Teredo, Linné.

Teredo sp.

Habitat.—Station 184, east of Cape York (in 1400 fathoms ?); Globigerina ooze.

A single very small specimen, all that was obtained, may possibly be the young state of the *Teredo* mentioned in the Report of the collections made during the Voyage of H.M.S. "Alert" in Torres Strait. The striæ on the anterior part of the valves are, however, rather coarser. Although from Station 184, to which a depth of 1400 fathoms is assigned, it seems probable that this shell, which contained the animal, got into the trawl near the surface, during the process of hauling in. This, however, is not certain, for water-logged wood might be found at that depth into which it might bore.

Subfamily Pholadinæ.

Martesia, Leach.

Martesia striata (Linné).

Pholas striata (Linné), Sowerby, Thesaurus Conch., vol. ii. p. 494, pl. civ. figs. 40–42, pl. cv. figs. 43, 44.
Pholas striata, Sowerby, Conch. Icon., vol. xviii. figs. 32*a–c*.
Martesia striata, H. and A. Adams Genera, vol. iii. pl. xc. figs. 5, 5*a*.

Habitat.—Station 190. Arafura Sea, in 49 fathoms: green mud.

Specimens from this locality present very slight if any variation in sculpture, but differ somewhat in the length of the hinder prolongation of the valves, and in the form of the anterior dorsal plate.

Subfamily Gastrochænin.æ.

Gastrochæna, Spengler.

Gastrochæna lamellosa, Deshayes (Pl. VIII. figs. 2–2*b*).

Gastrochæna lamellosa, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 328.
Gastrochæna lamellosa, Sowerby, Conch. Icon., vol. xx. fig. 14 (bad!).

Habitat.—Station 186, off Cape York, in 8 fathoms (Challenger); coral mud; Island of Zebu, Philippines (Cuming).

The figure in Sowerby's Monograph is not at all accurate, neither as regards the form of the gape nor the opposite extremity. The figure now given is taken from the type specimen in the British Museum.

Gastrochæna dubia (Pennant).

Mya dubia, Pennant, Brit. Zool., vol. iv. p. 88, pl. xliv. fig. 19.
Gastrochæna modiolina, Lamarck; Forbes and Hanley, Brit. Moll., vol. i. p. 132, pl. ii. figs. 5–8, and Pl. F. fig. 5 (animal).
Gastrochæna dubia, Deshayes, Traité Elem. Conch., pl. ii. figs. 4, 5.
Gastrochæna dubia, Jeffreys, Brit. Conch., vol. iii. p. 91, vol. v. pl. li. fig. 6.
Gastrochæna dubia, Hidalgo, Molusc. España, pl. xlix. figs. 3, 4.

Habitat.—Harbour of St. Vincent, Cape Verde Islands and Tenerife, Canaries, in 70 fathoms.

This species, ranging from the southern coasts of England to the Mediterranean, Madeira, and Canary Islands, has not, I believe, hitherto been noticed so far south as the Cape Verde Islands. The single specimen from that locality is a trifle more elongate than those from Tenerife.

Subfamily Clavagellin.æ.

Clavagella, Lamarck.

Clavagella torresi, n. sp. (Pl. VIII. figs. 1–1*b*).

Testa parva, tenuis, alba. Valva libera valde inæquilateralis, antice late rotundata, postice paulo angustior, lineis incrementi subrugosis sculpta, liris tenuissimis granulosis radiantibus umbones versus ornata. Pagina interna nitens, concentrice aliquanto rugosa, radiatim indistincte substriata. Ligamentum internum parvum, obliquum, postice denticulo minuto terminatum. Tubus inferne irregulariter ovatus, superne valde constrictus et angustatus, ad basim quoque ad latera tubulis multis instructus.

Of this small species only a single specimen was dredged. The lower portion of the tube is somewhat ovate, and broader at the inferior end. Above it is rather suddenly contracted into a small, plain tube, which is partly partitioned off within, from the main cavity, leaving only a narrow elongate opening of communication. The base and sides of the swollen portion of the tube are ornamented with numerous short tubuli. The interior of the tube is strengthened on the side of the free valve by a slender central ridge passing from the umbo of the fixed valve up the opposite side. The free valve is longer than high, considerably inequilateral, thin, white, very compressed, broadly rounded anteriorly, narrowed and produced behind. It is marked with rather coarse lines of growth, and ornamented at the upper part with very fine granular lines which radiate from the umbo not quite half-way across the valve. The beak is small, acute, slightly raised above the hinge line, and situated considerably in advance of the centre. The interior is glossy, somewhat wrinkled concentrically, and faintly substriated in the opposite direction. The muscular scars and pallial sinus are very indistinct. Just behind the apex of the umbo, and within the dorsal edge, there is a minute narrow groove terminated behind by a small denticle which receives a minute ligament.

Length of free valve 12 mm., height 8; greatest width of tube 9, smallest width 4; length of opening of communication between the narrow and swollen portions of the tube 3, width 1.

Habitat.—Torres Strait, in 3 to 11 fathoms.

Family Myidæ.

Subfamily Corbulinæ.

Corbula, Bruguière.

Corbula tunicata, Hinds.

Corbula tunicata, Hinds, Proc. Zool. Soc. Lond., 1843, p. 55.
Corbula tunicata, Reeve, Conch. Icon., vol. ii. fig. 5.
Corbula tunicata, Tryon, Amer. Journ. Conch., vol. iv. Appendix, p. 66.

Habitat.—Port Jackson, Sydney, in 4 to 18 fathoms; off Amboina, in 15 to 25 fathoms; and Station 189, Arafura Sea, in 25 fathoms; green mud.

The specimens from the first two Stations are fine large shells agreeing in every particular. The largest example is 28 mm. long, 19½ high, and 16 in diameter. Two specimens from the Arafura Sea are somewhat abnormal both in form and sculpture, occupying an intermediate position between this species and *Corbula crassa*. The latter species is more equivalve than *Corbula tunicata*, has the left valve sculptured throughout like the right, which has a much smaller and less curved-over umbo than that of the

present form. On the contrary, the left or smaller valve of *Corbula tunicata* has only the earlier portion strongly ridged, the rest of the surface exhibiting only lines of growth coated with a fibrous epidermis. The contrast between the two styles of ornamentation is so marked that the valve presents the appearance of having the umbonal portion of a differently sculptured species fixed on to its own smoother surface. The peculiarity, in the two specimens from the Arafura Sea, consists in their having a much larger proportion than usual of this valve strongly sculptured. In one there is scarcely any cessation of the concentric ridging, whilst in the other it extends over about two thirds of the surface. The ridges in this species are both more numerous and more rounded than in *Corbula crassa*, which also presents another distinction in very adult examples that is never met with in any specimens of any age of *Corbula tunicata*. I refer to the presence of fine denticulation upon the dorsal and ventral margins of the left valve. A still closer approach to the present species is met with in *Corbula sulcata* from West Africa. Here is a species which not only has the same form, but offers scarcely any difference in sculpture, and is mainly distinguished by a variation in colour.

Corbula crassa, Hinds, var.

Corbula crassa, Hinds, Proc. Zool. Soc. Lond., 1843, p. 53.
Corbula crassa, Reeve, Conch. Icon., vol. ii. figs. 8 *a–c*.

Habitat.—Torres Strait, in 3 to 11 fathoms (Challenger); Port Essington (J. B. Jukes, Esq., in Brit. Mus.); Straits of Macassar, Malacca (Hinds); Bais, Island of Negros, Philippines (Cuming).

The specimens from the above localities are somewhat different from the normal form found at the Philippine Islands. In stoutness and outline they correspond very closely, but are at once distinguished by the microscopic sculpture. The entire surface of the valves is covered with a dense mass of minute circular granules, arranged more or less regularly in closely packed radiating series. In the typical form the rows of granules, which are of the same character, are much farther apart, and the apices of the valves are smoother than in the variety which has the concentric ribs developed somewhat earlier. Beyond these differences there does not appear any reason for separating these two forms.

Corbula maegillivragi, n. sp. (Pl. X. figs. 8–8*b*).

Testa magna, elongata, crassa, albida, paulo inæquivalvis, valde inæquilateralis, antice rotundata, postice oblique truncata, ad extremitatem acute angulata, concentrice costata, et radiatim minute granulato-striata, costis pone carinam ab umbone ad extremitatem

posticam decurrentem tenuioribus, umbonesque versus subobsoletis. Margo dorsi anticus valde obliquus, subconcavus, posticus minus declivis, fere rectilinearis, elongatus. Margo ventris in medio late sinuatus, utrinque leviter excurvatus. Umbones parum prominentes, albi vel rubescentes, lævigati. Pagina interna alba, plus minusve olivaceo-fusco maculata, margine exteriori valvæ sinistræ in testis adultis hic illic minute denticulato. Dens cardinis valvæ dextræ erectus, acutus.

This is a large species, very long, not particularly convex, whitish, only slightly inequivalve, but very inequilateral. It is nearly twice as long as high, rounded at the anterior end, obliquely and sharply truncated behind, terminating in an acute point. The valves are moderately thick, and divided into two unequal parts by a sharp keel running obliquely from the beaks to the hinder extremity. They also exhibit a shallow depression down the middle, causing a sinus or incurvation in the ventral margin, which otherwise is slightly arcuate. The dorsal slopes are unequal, the anterior being short, very oblique and faintly concave, the posterior longer, less descending and nearly rectilinear. The sculpture consists of moderately strong, concentric ridges, which gradually increase in thickness with the growth of the shell, becoming behind the radiating carina slighter than in front. In addition, the entire surface exhibits very numerous, excessively fine, radiating lines, which are minutely granular, especially conspicuous in the grooves between the costæ. The beaks are only a little prominent, curve over towards the front, and are almost smooth at the tips, which are usually white, but at times pinkish. The single cardinal tooth of the right valve is erect, curved, and acute. The interior of the valves may be either almost totally white, or more or less stained with olive-brown, or occasionally with a pinkish tint. The margin of the left valve in old specimens is more or less minutely denticulated all round, a corresponding groove just within the circumference of the right valve being minutely pitted.

Length 26 mm., height 13, diameter 9.

Habitat.—Station 188, south of New Guinea, in 28 fathoms; bottom, green mud.

Young shells of this species and of *Corbula scaphoides* are very much alike. The latter are, however, flatter, more inequilateral, and have fewer and less elevated ridges, which are much more obsolete behind the oblique keel.

This species is not likely to be mistaken for any other on account of its large size and very elongate form. *Corbula crassa* offers some resemblance, but is proportionally higher, more equilateral, thicker, more coarsely ridged towards the umbones, more suddenly contracted at the posterior or rostrated extremity, and has stronger hinge characters.

Corbula scaphoides, Hinds (Pl. VIII. figs. 3–3*b*).

Corbula scaphoides, Hinds, Proc. Zool. Soc. Lond., 1843, p. 56.
Corbula scaphoides, Reeve, Conch. Icon., vol. ii. fig. 24.

Habitat—Torres Strait, in 3 to 11 fathoms (Challenger); Singapore and Philippine Islands (Hinds), Hong Kong Harbour (Bowring).

The specimens described by Hinds were apparently only the young of this species, judging from a single right valve obtained by the Challenger. This valve bears a considerable resemblance to the deep one of *Corbula tunicata* or *Corbula sulcata*, but is much broader at the upper part, the young shell being much more elongate in this species than in either of those mentioned. It is 25 mm. long, 17 high, and as deep as that of *Corbula tunicata*. The young shell, about 13 mm. in length, forms as it were an umbonal cap as in many species of this genus. From this point the concentric ridges gradually thicken, and are more or less undulating. They are attenuated anteriorly, and become more slender and closely packed at the carina, which runs from the beak to the posterior extremity, which is much narrowed, and has a pinched or nasute appearance. In young shells the surface is also ornamented with numerous excessively fine radiating granular lirae, which are not, however, traceable in the single adult valve, as the surface is too much worn. The hinder muscular scar is situated on a shelf-like projection, this feature being also noticeable in the young shells.

In the British Museum there is a single adult specimen of this species from Hong Kong Harbour, presented by J. C. Bowring, Esq. This is in perfect condition, but not quite as large as the Challenger valve. There certainly is a very close relationship between this species and *Corbula tunicata*, the main distinction consisting in the much longer umbonal portion of the valves in the present form. Both have exactly the same kind of radiating series of minute circular granules, the epidermis covering the lower half of the left valve is similar in both forms, and the muscular impressions are not very dissimilar, although in *Corbula scaphoides* the posterior stands out rather more than that of *Corbula tunicata*. Both have exactly the same stout, curved, and acute cardinal tooth in the deep valve, and their external ribbing is also similar.

Corbula modesta, Hinds.

Corbula modesta, Hinds, Proc. Zool. Soc. Lond., 1843, p. 57.
Corbula modesta, Reeve, Conch. Icon., vol. ii. fig. 14.
Corbula modesta, Smith, Proc. Zool. Soc. Lond., 1871, p. 728.

Habitat.—Amboina, in 15 to 20 fathoms; also Station 172, off Nukalofa, Tongatabu, in 18 fathoms (Challenger); Philippine Islands and Malacca (Hinds); Whydah, West Africa (Knocker).

Occasion has already been taken to remark upon the great similarity existing between two species of this genus, the one (*Corbula sulcata*) from the shores of Western Africa, the other (*Corbula tunicata*) from Amboina, the Philippines, North and East Australia. In the present instance I have to repeat the record of the existence of the very same shell from all these localities, with the exception of East Australia. A single example dredged by Captain Knocker, R.N., at Whydah, on the Dahomey shore, was referred to this species by myself in 1871. I have again most carefully examined it, and see no reason for altering that location. The apices of the umbones are of the same smooth porcellanous whiteness, bordered in front with a pinkish stain as in eastern specimens, the concentric ribbing is identical, the colour of the interior the same, and the hinge and muscular scars correspond in every respect.

If there were more specimens for examination, it is possible some distinguishing feature might present itself, but at present I feel certain of the identity of these shells from such widely remote and distinct zoological provinces.

Corbula philippii, n. sp. (Pl. VIII. figs. 4–4*b*).

Testa parva, valde inæquivalvis, inæquilateralis, triangulariter ovata, alba, valva sinistra epidermide fibrosa prope marginem induta. Valvæ crassiusculæ, diverse sculptæ. Valva dextra convexa, postice breviter rostrata, ad extremitatem truncata, obtuse bicarinata, costellis rotundatis, crassiusculis, concentricis, prope carinam anteriorem fere evanidis, instructa. Valva sinistra longe minor, incrementi lineis striata, liris paucis radiantibus ornata. Umbones valde prominentes, involuti, nivei, lævigati. Linea cardinis utrinque declivis, rectiuscula, fusco tincta.

This compact little species is very inequivalve, rather convex, somewhat inequilateral, triangularly ovate with the umbones well raised. The anterior end is sharply rounded, the posterior subrostrate, shortly and slightly obliquely truncate, the lower margin being well curved in front and at the middle, and very faintly incurved behind near the lower angle of the rostrum. It is white with the exception of a slight tinge of brown upon the hinge-margin, chiefly behind the beaks, and the left valve is clothed more or less, principally towards the lower outline, with a yellowish fibrous epidermis. The right valve, which is far the larger, has an obtuse ridge running from the apex obliquely to the lower end of the hinder truncation, marking off a definite and somewhat concave posterior area, and within this, close to the dorsal margin, it has a second less noticeable rounded carina. Its sculpture consists of rounded concentric ridges which gradually thicken as the shell increases. They are numerous, broader than the intervening grooves, attenuated (in some instances obsolete) anteriorly, and become mere striæ between the radiating carinæ behind. The left valve merely exhibits fine concentric lines of growth and a few (about

eight) inequidistant radiating ridges, which do not, however, extend quite up to the beaks. These in both valves are smooth, rather glossy, almost snow-white, and well rolled in and forward. The right valve has a simple strong erect cardinal tooth immediately beneath the beak, which fits into a corresponding pit in the left valve, behind which is a stout process or denticle supporting the ligament. The interior is more or less stained with brown, the anterior scar elongate, the posterior rounder, and the pallial line faintly sinuated.

Length 6 mm., height $5\frac{1}{4}$, diameter $3\frac{2}{3}$.

Habitat.—Station 33, off Bermuda, in 435 fathoms; coral mud: (Challenger); Hayti (Coll. Cuming in British Museum).

This interesting little species does not appear to agree with any of the numerous forms already described from the West Indian region. In the inequality of the valves it resembles *Corbula operculata*, Philippi, from St. Thomas Island, but differs from that species in size, form, the absence of the double keel in the right valve, and in the different sculpture of the left.

Corbula monilis, Hinds.

Corbula monilis, Hinds, Proc. Zool. Soc. Lond., 1843, p. 58.
Corbula monilis, Reeve, Conch. Icon., vol. ii. pl. v. fig. 35.

Testa minuta, alba, globosa, paulo inæquilateralis, antice rotundata, postice leviter producta, plus minusve truncata. Margo dorsi utrinque valde declivis, leviter arcuatus, ventralis late curvatus, postice paululum sinuatus. Valvæ mediocriter tenues, valde inæquales, liris concentricis gracilibus instructæ. Umbones magni, inflati, prominentes, antrorsum curvati.

This species, several specimens of which were obtained, all of the same minute dimensions, is somewhat inequilateral, considerably inflated, moderately thick for so small a shell, white, inequivalve, and marked with fine concentric liræ. The dorsal slopes are somewhat curved and very oblique, the ventral outline being slightly arcuate, and a little sinuated posteriorly. The anterior end is sharply rounded, the hinder extremity being a little produced and somewhat truncated. The umbones are rather large, elevated above the hinge line, and terminate in a minute glossy tip curved over towards the front. The right valve has a single erect, strong tooth, immediately beneath the apex of the beak, and in the left there is a triangular pit for its reception.

Length 2 mm., height $1\frac{3}{4}$, diameter $1\frac{1}{2}$.

Habitat.—Stations 186, 187, and 188, all in Torres Strait, North Australia, in 3 to 28 fathoms.

This minute form was originally described from specimens collected at the island of Luzon. The largest of these Philippine examples is $2\frac{3}{4}$ mm. long, $2\frac{1}{2}$ high, and 2 in diameter.

Neæra, Gray.

The number of species in this genus has very considerably increased of recent years, and although they have been subdivided to some extent by A. Adams,[1] and arranged into sections by Dr Gwyn Jeffreys,[2] some further revision appears to be still requisite. Adams' arrangement is based partly on hinge-characters and partly on external features, that of Jeffreys being founded solely on differences of sculpture, the result being that shells are found in the same sections with others, the hinges of which are very different, *e.g.*, *Neæra teres*, *Neæra semistrigosa*, *Neæra inflata*, &c.

Having examined a large number of species, I have found certain differences in their hinges which may form the basis of a rearrangement, in submitting which, however, I at present refrain from naming the sections in which I have grouped the species, awaiting still further material, so that their validity and usefulness may be tested. Those species whose names are marked with an asterisk (*) have been located from description only, and not from personal examination.

Section A. (*Neæra* proper).

Teeth.—A single more or less elongate lateral tooth on the posterior side in the right valve, none in the left.

Cartilage.—More or less obliquely inclined posteriorly.

Surface.—Concentrically striate, lamellated, or costate.

Neæra cuspidata, Olivi.
rostrata, Spengler.
obesa, Lovén.
subtorta, Sars.
hindsiana, A. Adams.
rosea, Hinds.
circinata, Jeffreys.
filocarinata, *kerguelenensis*, *platensis*, *angasi*, *meridionalis*, *consociata*, *azorica*, *capensis*, *patagonica*, *wollastonii*, all n. sp.
chinensis, Gray.
latisulcata, Tenison-Woods.
elegans, Hinds.

Neæra gracilis, Jeffreys.
bicarinata, Jeffreys.
depressa, Jeffreys.
limatula, Dall (?) = *contracta*, Jeffreys.
rugiosa, Jeffreys.
truncata, Jeffreys.[3]
arctica, Sars.*
glacialis, Sars.*
jugosa, Wood.*
peppria, Jeffreys.*
exigua, Jeffreys.*
nobilis, A. Adams.*
nasuta, A. Adams.*
trailli, Hutton.*

Neæra arcuata, Dall (?).*

[1] *Ann. and Mag. Nat. Hist.*, 1864, vol. xiii. p. 206.
[2] *Proc. Zool. Soc. Lond.*, 1881, p. 936.
[3] Left valve only examined.

Section B.—Subgenus *Cardiomya*, A. Adams = *Spathophora*, Jeffreys.

Teeth.—Same as in (*Neæra* proper) Section A.
Cartilage.—Less oblique than in the above.
Surface.—Radiately costate or lirate.

Neæra gouldiana, Hinds.
costellata, Deshayes.
fallax, n. sp.
pectinata, Carpenter.
costata, Sowerby.

Neæra concinna, Hinds.
striata, Jeffreys.
curta, Jeffreys.
multicostata, Verrill and Smith.*

Section C.

Teeth of right valve, *Cartilage-Pit*, and *Sculpture*, the same as in Section A, but a small erect posterior lateral tooth is present in the left valve.

Neæra pulchella, H. Adams.

Section D.

Teeth.—One small lateral tooth on each side near the beak in both valves (the anterior in the left being feeble).
Cartilage and *Surface* as in A and B.

Neæra singaporensis, Hinds.

Section E.

Teeth.—A short lateral tooth on each side in the right valve, with corresponding pits in the hinge-margin of the left, more conspicuous on the anterior side than behind.
Cartilage.—Obliquely inclined towards the posterior end.
Surface.—Concentrically striated.

Neæra teres, Jeffreys.

Section F.

Teeth.—A short erect lateral tooth on each side, and a small dentiform projection of the hinge-margin in front of the apex in the right valve, and a single tubercular denticle in front of the apex (but no laterals) in the left.

Cartilage.—Posteriorly inclined, not in a pit or process, but attached to the valves.
Surface.—Concentrically striate.

Neæra brazieri, n. sp.

SECTION G.—Subgenus *Rhinomya*, A. Adams.

Teeth.—One lateral tooth on each side in the right valve, none in the left.
Cartilage.—Internal, attached to the valve under the beaks.
Surface.—Concentrically striate.

Neæra rugata, A. Adams.*
philippinensis, A. Adams (*nec* Hinds).

Neæra notabilis, Jeffreys.*
lamellifera, Dall = *semistrigosa*, Jeffreys.

SECTION H.

Teeth.—One small conical tooth in front of the umbo in the right valve, none in left; no laterals in either.
Cartilage.—Narrow, under apex, parallel with margin.
Surface.—Concentrically striate.

Neæra philippinensis, Hinds.

SECTION I.

Teeth.—A single denticle in both valves in front of the beaks; no laterals.
Cartilage.—Elongate, narrow, subparallel with the dorsal edge.
Surface.—Concentrically plicate.

Neæra abbreviata, Forbes.

SECTION J.

Teeth.—One small thickish tooth on each side in the right valve, and a similar one in the left, in front only.
Cartilage.—Very small, central.
Surface.—Finely ridged.

Neæra adunca, Gould.

Section K.

Teeth.—A single acute denticle in the right valve in front of the cartilage-pit, and a long shelf-like process parallel with the posterior dorsal margin in each valve.

Cartilage-Pit.—Small, central or oblique.

Surface.—Concentrically striate.

Neæra claviculata, Dall. | *Neæra inflata*, Jeffreys.

Neæra congenita, n. sp.

Section L.

Teeth.—None in either valve.

Cartilage.—Small, oblong, attached to a thin shelly process and directed posteriorly.

Surface.—Concentrically lamellar or striated.

Neæra angularis, Jeffreys. | *Neæra sulcifera*, Jeffreys.

Section M.

Teeth.—None in either valve.

Cartilage.—Short, anteriorly inclined.

Surface.—Radiately costellate.

Neæra fragilissima, n. sp.

The subjoined Table will show at a glance the considerable difference in the structure of the hinges of the subgenera or sections. In some cases the teeth appear to be the same, as in A and B, and L and M, but in these instances there are other differences in the cartilage or sculpture which constitute the chief points of distinction.

	Right Valve.			Left Valve.		
Sections.	Anterior cardinal.	Anterior lateral.	Posterior lateral.	Anterior cardinal.	Anterior lateral.	Posterior lateral.
A			×			
B			×			
C			×			×
D		×	×		×	×
E		×	×		[1]	[1]
F	×	×	×	×		
G		×	×			
H	×					
I	×			×		
J		×	×		×	
K	×		×[2]			×[2]
L						
M						

The hinges of the following species are unknown to me, and therefore I have been unable to locate them in any of the proposed sections :—

Neæra crassa, Monterosato.
tasmanica, Tenison-Woods.
pura, Angas.
granulata, Dall.

Neæra jeffreysi, Dall.
casta, Hinds.
didyma, Hinds.
trigona, Hinds.

Section A.

Neæra patagonica, n. sp. (Pl. VIII. figs. 5–5*b*).

Testa *Neæra wollastonii* similis, sed crassior, paulo inæquilateralis, rostro postico longiori et graciliori desinita.

[1] Hinge margin with pits for reception of the teeth of the right valve.
[2] These are hardly teeth, but rather elongate, shelf-like processes within the hinge-margin.

Length 29 mm., height 14, diameter 12.

Habitat.—Station 305, west coast of Patagonia, in 165 fathoms; blue mud.

Both this species and *Neæra wollastonii* may eventually prove to be large varieties of *Neæra rostrata*, Spengler, being similarly sculptured. Still there is a considerable difference in form. The single left valve from the above locality has the apex of the umbo (viewing it from within) situated 13 mm. from the anterior end, or only one and a half in advance of the centre. From this it will be seen that it is more equilateral than *Neæra rostrata*, but less so than *Neæra wollastonii*.

Neæra wollastonii, n. sp. (Pl. X. figs. 6–6*b*).

Testa magna, tenuis, alba, haud nitida, globosa, ovata, postice longe rostrata, incrementi lineis tenuibus striata. Margo dorsi anticus oblique arcuatus, posticus minus declivis, levissime concavus. Ventris margo antice et inferne late arcuatus, ad rostrum late sinuatus. Rostrum elongatum, marginibus subparallelis, carina obliqua leviter curvata dimidiatum, ad extremitatem posticam subrecte truncatum. Umbones magni, involuti, ad apicem sublævigati, centrales. Pagina interna nitens, plus minusve radiatim substriata. Linea cardinis tenuis, subreflexa, sub umbone valvæ sinistræ loculo ligamentali parvo obliquo instructa.

This is a large thin shell, much inflated, ovate, and terminated behind in a long beak. It is white, with scarcely any gloss upon the surface, and sculptured with fine striæ of growth only. The hinder dorsal margin is slightly oblique and the least concave, the anterior being arcuate and more sloping, but this depends upon the position in which the shell is regarded. The anterior end is semicircularly rounded, the ventral outline more broadly curved and widely sinuated at the commencement of the rostrum. This has the upper and inferior margins almost parallel, the extremity nearly abruptly truncate, and is obliquely bisected by a slight radiating ridge. The umbones are considerably elevated, exactly central, smoothish, and incurved at the tips. The hinge-line in the left valve is thin, a little expanded upwards on both sides of the umbo, immediately beneath which is a very small ligamental pit directed obliquely towards the hinder end. The interior is glossy, and exhibits a distinct substriation about the central parts. The posterior muscular scar is elongate, and situated under the dorsal line not quite half-way from the umbo to the end of the rostrum.

Length 26 mm., height $14\frac{1}{2}$, presumed diameter of the complete shell 12.

Habitat.—Station 73, a little west of the Azores, in 1000 fathoms; Pteropod ooze.

I have named this species in remembrance of the late T. V. Wollaston, who contributed so much to our knowledge of the fauna of the islands of the Atlantic. It is a

larger shell than *Neæra rostrata*, Spengler, although very similarly sculptured, and terminates in a much shorter posterior rostrum.

Neæra consociata, n. sp. (Pl. IX. figs. 7–7*b*).

Testa parva, tenuis, pellucida, globosa, postice subito rostrata; rostrum breve, truncatum, incrementi lineis subvalidis sculptum, carina obliqua distincta dimidiatum. Valvæ antice rotundatæ, inferne late arcuatæ, postice prope carinam subprofunde sinuatæ, lamellis brevibus paucis (circa decem) ornatæ. Umbones læves, leviter prominentes, antemediani, fere in $\frac{1}{3}$ longitudinis collocati. Cardo in valva sinistra edentulus, in dextra ? Fossa ligamenti linearis, margine dorsali parallela, haud intus projecta.

This species must approach very closely *Neæra lamellifera* of Dall, and may indeed prove eventually to be the young state or a variety of it. It may, however, be at once distinguished from that species, which is only known to me by description, by the distinct keel, which, starting from the lower corner of the rostrum, curves up obliquely towards, but does not extend quite to, the umbones. The latter, too, are apparently placed more forward, being just a shade more than one-third of the total length from the anterior end, whilst in *Neæra lamellifera* they appear to be very little in advance of the centre. Both species are similarly sculptured with fine concentric lamellæ, and there is probably not much difference in the ligamentary fossette. The freshest valve procured is thin, glassy, and subtransparent, and, on examination under the microscope, presents a minutely punctate surface towards the umbo, both within and without.

Length $4\frac{1}{3}$ mm., height 3, approximate diameter $2\frac{1}{3}$.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms, Pteropod ooze; and Station 33, off Bermuda, in 435 fathoms, coral mud.

Neæra azorica, n. sp. (Pl. X. figs. 7–7*b*).

Testa tenuis, inæquilateralis, ovata, superne recta, vix rostrata, mediocriter convexa, haud nitida, rugis concentricis minutis irregularibus postice subito obliquis ornata. Margo dorsi fere rectus, antice leviter curvatus. Latus anticum breve, rotundatum, posticum longius, rostro brevissimo, impressione haud profunda ab umbone radianti signato, terminatum. Ventris margo late arcuatus, postice ad impressionem levissime sinuatum. Umbones parvi, parum prominentes, nucleo nitente obtuso instructi, ante medium collocati. Ligamentum minutum, obliquum.

Only a single left valve is at present known of this species. It is small, thin, rather inequilateral, irregularly ovate, having the upper margin nearly straight and the posterior end only a very little beaked. It is semitransparent-white, moderately convex,

and sculptured with numerous concentric, very fine, and irregular wrinkles, which, in a depression that marks off the slight rostrum, turn suddenly to the right in an oblique direction. The front and lower outlines are regularly curved, the latter, however, exhibiting a slight sinuation at the radiating depression. The front portion of the dorsal edge is very short, feebly excurved, the posterior, on the contrary, being long and almost rectilinear, or very slightly concave. The umbo is small, but little raised, situated considerably in front of the middle, and terminates in a minute glossy vitreous obtuse boss. The hinge-plate is thin, bearing immediately below the beak a minute oblique ligamental pit. The interior is glossy, with only faint muscular scars.

Length $4\frac{2}{3}$ mm., height $3\frac{1}{2}$, presumed diameter of a complete specimen $2\frac{1}{2}$.

Habitat.—Station 78, east of the Azores, in 1000 fathoms; volcanic mud.

This species is remarkable for the smallness of the rostrum and the peculiar wrinkled character of the concentric sculpture.

Neæra circinata, Jeffreys (Pl. X. figs. 4–4*b*).

Neæra circinata, Jeffreys, Ann. and Mag. Nat. Hist., 1876, ser. 4, vol. xviii. p. 497.
Neæra circinata, Jeffreys, Proc. Zool. Soc. Lond., 1881, p. 942, pl. lxxi. fig. 6.

Habitat.—Station 73, west of the Azores, in 1000 fathoms, volcanic mud; and at Station 85, Canary Islands, in 1125 fathoms, volcanic mud (Challenger). Other localities which I give on the authority of Dr. Jeffreys, all north Atlantic, lat. 56° 11′ N., long. 37° 41′ W., in 1450 fathoms; off the west of Ireland, lat. 56° 7′ N., long. 14° 19′ W., in 630 fathoms; west of Portugal, lat. 39° 55′ N., long. 9° 56′ W., in 994 fathoms; Bay of Biscay.

The figure in the Proc. Zool. Soc. gives a fair idea of the Challenger specimens, but certainly exhibits a too sudden contraction of the rostrum, consequently the sinus in the ventral outline becomes too deep. The upper angle is not sufficiently sharp, and the position of the umbones is too forward, being in the shells before me (when viewed in the same position as the figure) exactly midway between the extremities. If these specimens had not been examined by Dr. Gwyn Jeffreys, and pronounced to belong to this species, I should almost have felt warranted in separating them specifically, for besides the differences already alluded to, there are other points in which they do not agree with the description in the Annals. There no mention is made of the position of the beaks, the shell is described as "rather solid," and as having "about twenty-five fine concentric and equidistant lamellar ridges or striæ in the middle of the shell, which become compressed in front and disappear at the sides." The Challenger shells certainly are not "rather solid," but may be so in comparison with certain other species, and the concentric lamellæ, in a specimen of the same size as that figured by Jeffreys, are considerably more numerous, there being as many as forty. Another feature which is not referred to by

Jeffreys is the presence of a rather strongly marked impressed ray within the valves, extending obliquely from beneath the umbones down the anterior side.

Neæra obesa, Lovén.

Neæra obesa, Lovén, Öfversigt k. Vetensk.-Akad. Förhandl., 1846, p. 202, No. 326.
Neæra obesa, Sars, Moll. Arct. Norv., p. 86, pl. vi. figs. 4*a–c*.
Neæra pellucida, Stimpson, Invert. Grand Manan, p. 21, pl. i. fig. 13.

Habitat.—Station 78, off San Miguel, Azores, at a depth of 1000 fathoms, volcanic mud (Challenger); West Norway, in 40 to 650 fathoms (Sars); Eastern North America (Verrill); off Long Island, in 40 fathoms (Stimpson). Atlantic Ocean, lat. 47° 38′ N., long. 12° 8′ W., 2435 fathoms (Jeffreys, "Porcupine" Exped., 1869); also Stations 1 and 3 of the 1870 Expedition; lat. 48° 38′ N., long. 10° 15′ W., 567 fathoms; lat. 48° 31′ N., long. 10° 3′ W., 690 fathoms.

A single small right valve from the above Station, only 5 mm. in length, is all that was obtained of this species. In form and sculpture it corresponds precisely with the above quoted figure of Sars.

Neæra meridionalis, n. sp. (Pl. IX. figs. 6–6*b*).

Testa fragilis, tenuissima, alba, concentrice subrugose striata, epidermide tenui induta, paulo inæquilateralis, alta, antice late rotundata, postice breviter lateque rostrata. Valvæ fere æquales, subtumidæ, sinistra sulco haud profundo ab umbone radianti prope extremitatem posticam sculpta. Margo dorsi anticus brevis, primo parum obliquus, aliquanto arcuatus, posticus horizontalis, fere rectus; margo inferior late curvatus, antice subito ascendens, posterius oblique surrectus, leviter sinuatus. Fossa ligamenti minima, obliqua. Pagina interna nitida, radiatim substriata, dense minuteque granulata.

This is a broadly rostrate species, excessively thin, high, tumid, broadly rounded in front and somewhat obtusely wedge-shaped behind. It is white, covered with a very thin epidermis, and exhibits distinct lines of growth and a shallow groove in the left valve, radiating from the apex to the margin near the hinder extremity, there being only the faintest indication of a similar furrow in the opposite valve. The dorsal margins are very unequal. The anterior is short, faintly excurved at first, then arcuate and suddenly descending, forming with the upcurved lower margin a broadly rounded extremity. The posterior margin is much longer, almost horizontal and straight, and the ventral outline is widely arcuate, except behind, where it rises with a faint incurvation in an oblique direction. The umbones are rather large and tumid. The cartilage-pit is very small, inclined towards the posterior end, and the lateral lamellar tooth of the right valve is elongate. The internal surface of the valves is somewhat glossy, exhibits a sort of close radiating substriation, and, under the microscope, appears to be minutely granular.

Length 17½ mm., height 11, diameter 7⅓.

Habitat.—Station 157, in the Southern Ocean south-west of Australia, at a depth of 1950 fathoms; Diatom ooze.

This species is peculiarly broadly beaked, rather swollen, and excessively thin. Since this description was written the unique specimen has been accidentally smashed, only the crushed fragments remaining. It is, however, probably capable of partial repair, and it is fortunate that it had already left the artist's hands before it was destroyed.

Neaera filocarinata, n. sp. (Pl. X. figs. 5–5*b*).

Testa elongata, antice globosa, postice subanguste rostrata, tenuissima, albida, haud nitida, lineis regularibus elevatis concentricis rostrum versus corrugatis sculpta. Margo dorsi anticus declivis, parum arcuatus, posticus paulo concavus, obliquus; margo inferior curvatus, postice ad rostrum leviter sinuatus. Rostrum rotunde truncatum, carina filiformi radianti arcuata dimidiatum, et carina alia prope marginem dorsalem instructum, striis transversis corrugatus lineisque paucis radiantibus inconspicuis insculptum. Umbones parvi, parum producti, paulo antemediani. Valva sinistra omnino edentula, dextra dente unico laterali tenui utrinque instructa. Ligamentum parvum, obliquum.

This is a very thin species, rather globular, with the exception of the posterior rostrated portion. It is somewhat inequilateral, whitish, without gloss, sculptured with very fine and rather regular concentric elevated lines which become more or less indistinct and wrinkled in the faint depression marking off the rostrum. The front dorsal margin is very faintly excurved and rather sloping, the hinder, on the contrary, being a little concave, longer, and also oblique. The ventral is broadly excurved in front and at the middle, but has a shallow sinuation at the depression towards the commencement of the rostrum. This is roundly truncated at the end, and is divided by a distinct, slightly arcuate, thread-like ridge, which radiates from the beak to the lower extremity. It also exhibits a similar but rather more slender keel close under the upper margin. It is sculptured by wrinkled cross lines of growth, and bears in addition a few inconspicuous radiating lines. The umbones are not much elevated above the hinge-line, small, inclined towards the front, glossy at the tip, and situated rather in advance of the centre. The left valve is altogether toothless. The right has a single lamellar tooth on each side, the anterior being a trifle nearer the apex than the posterior, which, however, is the larger of the two. The ligament is small and inclined posteriorly. The interior is shining and concentrically streaked with opaque white upon a subpellucid white ground.

Length 9½ mm., height 5¾, diameter 5.

Habitat.—Station 98, off West Africa, in 1750 fathoms; Globigerina ooze.

Neæra capensis, n. sp. (Pl. IX. figs. 5–5*b*).

Testa tenuis, ovato-rostrata, inæquilateralis, albida, epidermide tenuissima induta, incrementi lineis striata, latere antico subacute rotundato, postico anguste rostrato, rostro circiter $\frac{1}{3}$ longitudinis æquante. Margo dorsi anticus valde declivis, leviter convexus, posticus longior, minus obliquus, concavus. Ventris margo regulariter arcuatus, postice ad rostrum sinuatus. Umbones paulo postmediani, leviter supra marginem elevati.

Like most species of *Neæra* this is very thin and fragile. It has a rather long beak behind, is somewhat acutely rounded in front, rather angular at the apex, and well curved below. It is inequilateral owing to the length of the rostrate end, whitish, and covered, more or less, with a thin but roughish epidermis, which is less worn off the beak than elsewhere. The front dorsal outline is slightly convex and considerably sloping, the posterior being somewhat longer, less oblique, and gently concave. The sculpture consists of fine concentric lines of growth, most conspicuous upon the beaks. The cartilage-pit is small, the lamellar lateral tooth of the right valve moderately long and erect, and the scars and pallial line very indistinct.

Length 15 mm., height 8, diameter 5.

Habitat.—Station 142, off the Cape of Good Hope, at a depth of 150 fathoms; green sand.

This, like several other species of the genus, is principally distinguished by its shape, there being little of importance as regards sculpture, epidermis, and hinge to separate it from certain allied forms. It differs from *Neæra rostrata*, Spengler, in possessing a shorter beak, and the ventral margin in front of the rostrum is longer and less arcuate. In outline it more closely resembles *Neæra hindsiana*, A. Adams, from Japan, but differs from it in having finer concentric sculpture and a more acute anterior end.

Neæra platensis, n. sp. (Pl. IX. figs. 4–4*b*).

Testa tenuis, albida, elongata, antice acute rotundata, postice sublonge rostrata, mediocriter globosa, incrementi lineis striata, haud nitida. Margo dorsi anticus primo rectiusculus, deinde obliquus, parum arcuatus, posticus elongatus, paulo declivis, subrectilinearis vel leviter concavus. Margo inferior late arcuatus, postice sub rostro sensim sinuatus. Umbones leviusculi parum prominentes, paulo ante medium collocati. Rostrum impressione radianti definitum, subabrupte truncatum. Valva dextra dente laterali lamelliforme postico instructa. Fossa ligamenti valvæ sinistræ minuta, paulo obliqua. Linea cardinis ante umbones leviter expansa.

This species is very thin, ovate-rostrate, moderately convex, sharply rounded in front, and ends behind in a rather long but not very slender beak. It is white, without

lustre, and sculptured with fine lines of growth. The valves exhibit a broad shallow depression, radiating from the umbones and marking off the rostrum. This is rather abruptly truncate at the end, and faintly ridged from the beak to the lower corner, with the lines of growth rather strongly developed. In the left valve there is a second slight ridge, very close to the upper margin, marking off a linear dorsal area. The front dorsal margin rises a little, close to the umbo, then descends obliquely with only a very slight curve. The posterior margin is longer, slopes but very little, and is the least concave. The ventral outline forms under the main portion of the shell a regular broad curve, but at the termination of the radiating depression is gently sinuated. The umbones are only a little elevated, and somewhat in advance of the centre. The left valve is toothless, but possesses a minute and slightly oblique cartilage-pit just under the apex. The right valve has a single slender elongate lamellar tooth on the posterior side, and the hinge-line in both valves in front is a little expanded. The muscular impressions are very feebly indicated.

Length 13 mm., height 7, diameter 5.

Habitat.—Station 320, off the mouth of the Rio de la Plata, in 600 fathoms; green sand.

In form this species resembles to some extent *Neæra obesa*, Lovén, and *Neæra limatula*, Dall. It is less convex than the former, is more sharply rounded in front, and has less prominent umbones, the latter being more strongly sculptured.

Neæra kerguelenensis, n. sp. (Pl. XXIV. figs. 8–8*b*).

Testa parva, subglobosa, postice breviter rostrata, concentrice lirata, liris tenuibus valde elevatis, supra rostrum flexuosis, ad liram obliquam medianam obsoletis. Margo dorsi anticus rectiusculus, declivis, posticus paulo concavus, minus obliquus. Margo inferior antice et in medio late curvatus, sub rostro distincte sinuatus. Umbones parvi, circa in medio, ad cacumina leves. Valva dextra dente unico valido submarginali pone umbonem munita, valva sinistra contra edentula.

This little shell is rather globose, nearly equilateral, rounded in front, much contracted and beaked behind. It is white, and ornamented with about twenty, fine, much elevated, concentric, lamelliform lirae, which are attenuated and flexuous in a depression or constriction marking off the rostrate end, and almost terminate at a slight keel which runs from the umbones to the lower corner of the curved truncate beak. Above this carina there is a second finer one, but nearer to the dorsal edge. The front dorsal margin is somewhat oblique, but not much curved, the posterior being rather concave. The ventral outline is distinctly sinuate under the rostrate end, and greatly arcuate at the lower part and in front. The umbones are small, nearly central, and smooth at the tips. The hinge is composed of a single strongish tooth in the right valve, situated within the dorsal margin just behind the umbo.

Length 4⅓ mm., height 3, diameter 2½.

Habitat.—Off Christmas Harbour, Kerguelen Island, in 120 fathoms.

A pretty little species, remarkable for its elevated thin lamelliform liræ.

Neæra angasi, n. sp. (Pl. IX. figs. 2–2*b*).

Testa *Neæræ rostratæ* similis, sed margine dorsi antico magis obliquo, rectiusculo, margine ventrali postice minus subito contracto, denteque laterali posteriori valvæ dextræ graciliori.

Length 9½ mm., height 5, diameter 3½.

Habitat.—Station 164B, off the coast of New South Wales, in 410 fathoms; green mud.

This species is so very like *Neæra rostrata* of Spengler, that to give a detailed description of it becomes unnecessary. It does, however, differ a little in form, the hinder dorsal slopes being almost rectilinear and a trifle more oblique. There is a difference also in the lower margin, the contraction at the commencement of the rostrum being less sudden, and the anterior end is rather more acute. The sculpture in both forms is of the same character, although that in the Australian shell is perhaps somewhat more delicate. The present species has also a smaller and more slender hinder lateral tooth in the right valve. I have much pleasure in naming this species after my friend G. F. Angas, Esq., who has written several important papers on the Molluscan fauna of Australia.

Since the above description was written the only specimen obtained has been accidentally smashed, but fortunately after leaving the artist's hands.

Neæra elegans, Hinds.

Neæra elegans, Hinds, Proc. Zool. Soc. Lond., 1843, p. 76.
Neæra elegans, A. Adams, Ann. and Mag. Nat. Hist., 1864, vol. xiii. p. 206.
Neæra moluccana, Adams and Reeve, Zool. Voy. Samarang, Mollusca, p. 84, pl. xxiii. fig. 4.

Habitat.—Station 189, Arafura Sea, south-west of New Guinea, in 25 fathoms, green mud (Challenger); New Guinea, China Sea, and Singapore, on a muddy floor, in from 7 to 18 fathoms (Hinds); Molucca Islands, Gillolo (Adams and Reeve); Mino Sima, Japan, in 63 fathoms (A. Adams).

I fully concur with Adams and Tryon[1] in considering the *Neæra moluccana* synonymous with this species. It is a form easily recognised by the peculiarity of its oblique sculpture. It is rather convex, thin, not glossy, covered more or less with a very thin pale epidermis, sharply rounded in front, contracted and narrowly rostrate behind. The ventral outline is regularly widely arcuate under the main portion of the shell, with a sudden sinuation at the commencement at the beak. The anterior dorsal margin is

[1] *Amer. Journ. Conch.*, vol. iv., Appendix, p. 97.

faintly curved and rather oblique, the posterior, which is somewhat longer, being, on the contrary, considerably concave. The valves are all but equal, and sculptured with numerous oblique, wavy, slender ridges, which almost disappear in front, leaving a comparatively smooth lunular space, and vanish posteriorly at a fine radiating keel which bisects the rostrum. The latter bears nearer the dorsal edge a second carina, which, being slightly curved, marks off a smooth narrow dorsal area, the space between the ridges being, on the contrary, marked with rather rough transverse lines of growth, these on the rest of the valve, being concentric, cut across the oblique riblets. The cartilage-process is small, short, and inclined slightly posteriorly. The right valve has a thin elongate hinder lateral tooth.

Neæra sp.

Habitat.—Station 23, off Sombrero Island, West Indies, in 450 fathoms; Pteropod ooze.

Only the umbonal portion of a right valve was obtained, which, on account of its large size, may be worth recording. It indicates a species of as large size as *Neæra chinensis*, Gray, and equally solid. It evidently has a long slender rostrum, and is sculptured like *Neæra rostrata*, Spengler. It has a trigonal cartilage-pit having the lower margin rounded and placed almost perpendicularly under the tip of the beak. There is a very strong short erect hinder lateral tooth, immediately beneath which is a very deep muscular scar.

Neæra sp.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

A single left valve from the above Station is apparently distinct from all the numerous known species of this genus. It is very thin, probably young, pellucid, moderately convex, shortly rostrate, glossy, and sculptured with fine lines of growth towards the lower outline. The hinge-line is almost horizontal, very slightly excurved anteriorly, and very feebly concave behind. The anterior end is broadly rounded, and joins the dorsal margin with a rounded angle. The lower outline is well curved, rising considerably at the posterior end, where it is also shallowly sinuated. The beak, divided by a slight ridge radiating from the umbo to the lower corner, exhibits one or two other very faint raised radiating lines, and is rather abruptly truncated. The umbo is small, shining, only a little elevated, and placed a trifle in front of the centre. The cartilage-pit is very small, oblique, and just under the apex.

Having but a single valve for examination, and that probably immature, it would be unwise to name it specifically; however, the record of its existence may possess some value.

Section B.

Neæra curta, Jeffreys.

Neæra curta, Jeffreys, Ann. and Mag. Nat. Hist., 1876, ser. 4, vol. xviii. p. 495.
Neæra curta, Jeffreys, Proc. Zool. Soc. Lond., 1881, p. 943, pl. lxxi. fig. 10.

Habitat.—Station 75, off the Azores, in 450 fathoms; volcanic mud; also Station 33, off Bermuda, in 435 fathoms; other localities given by Jeffreys are Stations 16 and 17, lat. 39° 55′ N., long. 9° 56′ W., 994 fathoms; lat. 39° 42′ N., long. 9° 43′ W., 1095 fathoms; and 24 to 28*a* of the "Porcupine" Expedition, 1870.

A single left valve from Station 33, measuring 9½ mm. in length and 6½ in height, agrees very closely with the figure cited above. This, too, is the specimen referred to by Jeffreys in the Proc. Zool. Soc. Lond. (*loc. cit.*). It exhibits one slight difference, namely, in lacking the radiating striæ on the anterior side. I think it likely that this may be the same species as that referred by Dall to *Neæra costellata* (var. *corpulenta*).[1]

A perfect shell containing the animal, from Station 75, shows that the right valve is rather smaller than the left, the ventral margin of which projects slightly beyond the other.

Neæra fallax, n. sp. (Pl. X. figs. 2–2*b*).

Testa tenuissima, globosa, antice acute rotundata, postice breviter rostrata, incrementi lineis striata, liris radiantibus tenuibus postice instructa. Margo dorsi anticus arcuatus, valde declivis, posticus paulo concavus, obliquus. Margo inferior late curvatus, postice leviter sinuatus et crenulatus. Umbones leves, paulo post medium collocati. Dens lateralis posticus valvæ dextræ elongatus, usque ad rostrum productus. Pagina interna subnitida, postice radiatim subsulcata.

This species is rather globose, somewhat inequilateral, thin, narrowed to a sharply rounded end in front, contracted and shortly beaked behind. It is smooth towards the umbones, sculptured elsewhere by fine lines of growth, and ornamented upon the hinder half of the valves with about sixteen fine radiating lirae, of which those upon the beaked extremity are the finest. The anterior dorsal outline is rather longer than the posterior, much sloping and excurved, the hinder, on the contrary, being obliquely concave. The ventral margin is broadly arcuate, with the exception of a faint sinuation at the rostrum, where it is somewhat crenulated. The beaks are smooth, only slightly prominent, and to the naked eye appear to have a posterior inclination, but in reality are turned at the apex towards the front. The hinder lateral tooth of the right valve is rather long, extending to the commencement of the narrowed extremity. The interior

[1] *Vid. Bull. Mus. Comp. Zool.*, vol. ix., No. 2, p. 110.

of the valves is shallowly radiately grooved towards the posterior end, and exhibits a moderately strong supporting ridge beneath the umbo.

Length 7 mm., height 5, diameter 3½.

Habitat.—Station 185B, east of Cape York, in 155 fathoms; coral sand.

Section E.

Neæra teres, Jeffreys (Pl. X. figs. 3–3*b*).

Neæra teres, Jeffreys, Proc. Zool. Soc. Lond., 1881, p. 939, pl. lxxi. fig. 2.

Testa tenuis, semipellucido-albida, serica, globosa, rotundato-triangularis, postice breviter rostrata, æquivalvis, æquilateralis, ad extremitatem posticam hians. Margo dorsi anticus declivis, vix excurvus, posticus obliquus, concavus. Ventris margo late arcuatus, prope rostrum leviter sinuatus. Valvæ concentrice tenuiter striatæ, carina obliqua, filiforme, radianti, rostrum dissecante, ad instructæ, lirisque paucis aliis tenuibus radiantibus inter carinam et marginem dorsi ornatæ. Umbones nitidi, mediocriter elevati, mediani, apicibus antice versis. Dentes cardinales nulli. Laterales duo in valva dextra breves, lamelliformes, valde prominentes. Ligamentum obliquum, latus posterius versus inclinatum, in loculamento insigne, postice acuminato, in valva sinistra situm. Pagina interna nitida, radiatim striata. Cicatrix anterior parva, postica major, porca rotundata valida intus marginata.

This species is rather globose, triangularly rounded, shortly beaked, and gaping behind, thin, semitransparent-white, and exhibits towards the lower outline, and upon the rostrum, more or less of a thin fibrous epidermis. The valves are equal and have a silky appearance, being sculptured with fine striæ of growth. The beaked portion terminates in a short curved truncation, and is divided down the middle by an oblique, slightly arcuate thread-like carina, extending from the umbo to the lower end of the rostrum. Between this keel and the dorsal margin, the surface is ornamented with a fewer, finer, and less conspicuous radiating liræ, which are crossed by rougher lines of growth than those upon the rest of the shell. The dorsal margin is moderately oblique on both sides, being nearly rectilinear in front, and gently concave behind. The anterior end and ventral outlines are regularly curved, but the latter, behind, under the rostrum, is just faintly incurved or sinuated. The umbones are fairly raised, glossy at the tips, which are curved over towards the front and situated midway between the extremities of the shell. The right valve has a very prominent lamellar lateral tooth on each side rather near to the apex, the posterior, after being suddenly truncate behind, is continued in the form of a slightly elevated ridge, immediately under the dorsal margin, some distance along the rostrum. There are no cardinal teeth in either valve. The left valve has the margin thickened on both sides, especially in front of the umbo, near

which there is a peculiar pit for the reception of the anterior lateral tooth of the other valve. The ligament is directed obliquely backwards, and is sustained in the left valve in a small but thickish process which juts out distinct from the dorsal margin. The interior is glossy, but marked with shallow radiating grooves or striæ, which are even more or less visible externally, owing to the transparency of the shell. The anterior scar is small, the posterior rather larger, and margined on the inner side by a strong rounded ridge descending from above, under the dorsal slope.

Length 10 mm., height 7, diameter $4\frac{2}{3}$.

Habitat.—Station VIII., off Gomera, Canary Islands, in 620 fathoms: volcanic mud.

The shells here described have been referred by Jeffreys[1] to his *Nevera inflata*, which, however, upon examination, proves quite distinct. The form of that species is somewhat different, the right valve possesses "a small upright triangular cardinal" tooth, and there is "a long laminar lateral on the posterior side" in the left, both of which are wanting in these specimens, which differ also in being radiately lirate upon the rostrum and in some of the hinge-characters. Since writing the above description, I have had an opportunity of examining the type of this species, and find that these Challenger specimens are undoubtedly conspecific.

Section F.

Neæra bracieri, n. sp. (Pl. IX. figs. 3–3*b*).

Neæra (*Rhinomya*) *rugata*, Angas (*non* A. Adams), Proc. Zool. Soc. Lond., 1867, p. 914.

Testa parva, elongata, sublonge rostrata, inæquilateralis, mediocriter convexa, alba, lamellis tenuissimis concentricis, supra rostrum coarctatis minusque elevatis instructa. Margo dorsi anticus valde declivis, leviter arcuatus, posticus concavus, elongatus. Margo inferior antice et in medio arcuatus, postice haud profunde sinuatus. Rostrum angustum, rotunde truncatum, bicarinatum, valvæ reliquo impressione levi notatum. Umbones parvi, subconici, vix involuti, antemediani. Dentes laterales valvæ dextræ breves, valde erecti, prope apicem collocati. Valva sinistra tuberculo dentiformi, paulo ante apicem munita.

The shell of this species is small, rounded in front, and terminates posteriorly in a moderately long and narrow beak. It is not very convex, rather inequilateral, white, and not glossy. The valves are somewhat unequal in size; the right is the smaller, of a narrower appearance, and falls within the ventral margin of the left when the valves are closed. They are marked posteriorly with a broad shallow depression radiating from the umbo to the ventral margin, and marking off the rostrum. The sculpture consists of from twenty to thirty slender concentric lamellæ, which become crowded and less erect towards the depression, and upon the beak. This exhibits a faint

[1] *Proc. Zool. Soc. Lond.*, 1881, p. 942.

ridge down the middle from the apex to the lower extremity, and a more distinct keel nearer the dorsal margin, marking off a smooth upper area. The front dorsal margin is very oblique, somewhat curved, and shorter than the posterior, which is less sloping and rather concave. The ventral outline is widely arcuate in front and at the middle, but shallowly sinuate at the depression. The umbones are small, only slightly raised above the hinge-line, hardly incurved, and, at the extreme tip, do not appear to incline either anteriorly or posteriorly, although, when the valves are viewed externally, they curve over towards the hinder side. The right valve has a short but very erect lamellar lateral tooth on each side near the umbo, the posterior, however, is prolonged under the dorsal margin, in the form of a ridge, some distance along the rostrum. It also has, just in front of the apex, a small triangular dentiform projection of the dorsal margin. The left valve has no lateral, but a single thickish tubercular denticle, just in front of the apex. The ligament is small, oblique, and posteriorly inclined, not in a prominent process, but attached to the inner surface of the shell. The interior is glossy, exhibiting more or less of the external concentric ribbing, especially in the right valve. The muscular impressions are indistinct.

Length 6 mm., height $3\frac{2}{3}$, diameter 2.

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms (Challenger); Moreton Bay (British Museum).

Section K.

Neæra clavicula, Dall (Pl. IX. figs. 8–8*b*).

Neæra clavicula, Dall, Bull. Mus. Comp. Zoöl., vol. ix., No. 2, p. 112.

Habitat.—Station 33, off Bermuda, in 435 fathoms; coral mud.

None of the Challenger specimens are as large as that described by Dall from Station 44 of the "Blake" Expedition, the largest being only 6 mm. in length. The right valve has a singular acute (almost hooked) denticle just in front of the apex, the left being entirely without teeth. The great feature of this species is the peculiar shelf-like expansion within the posterior dorsal margin, the special use of which is at present a matter of conjecture. It may be for the reception of the hinder adductor muscle, although I am inclined to believe such is not the case.

Neæra congenita, n. sp. (Pl. X. figs. 1–1*b*).

Testa *Neæra clavicula* similis, sed angustior, minus convexa, postice latius rostrata, margine dorsi postico rectiusculo, ventrali postice vix sinuato, clavicula interna magis elongata, et ligamenti fossa angustiori instructa.

This species, on account of the internal shelf-like process beneath the posterior dorsal margin, is closely related to *Neæra clavicula*ta of Dall, and may best be recognised by a comparative description. It is less globose than that species, a little narrower, more broadly rostrate behind, the ventral margin being regularly curved, and without a shallow posterior sinuation, and the dorsal outline, behind the beak, scarcely at all incurved. The umbones are placed more forward than in *Neæra clavicula*ta, and do not curve over so much towards the posterior end. Within I find two differences. In the first place the "clavicle" is longer, and commences at the upper end under the dorsal margin, whilst in Dall's species the inner margin of the clavicle is joined above to the process which receives the internal hinge-cartilage. The second distinction consists in the narrower character of this process, which also is almost parallel with the hinder dorsal edge, whilst in *Neæra clavicula*ta it juts farther out into the shell.

Length 4 mm., height $2\frac{2}{3}$, presumed diameter $2\frac{1}{3}$.

Habitat.—Station 33, off Bermuda, in 435 fathoms; coral mud.

Only a single left valve is at present known of this species, and that probably not full grown. Were there no other difference except that of form I should have hesitated to have separated it from *Neæra clavicula*ta; seeing, however, that the clavicle and hinge are also dissimilar, I have no doubt of this being a distinct species. It is unfortunate that no right valve is at hand for examination, for most likely a modification of the peculiar subhooked tooth, met with in the allied form, would occur in this species. I am exceedingly sorry to have to record the complete destruction, through the carelessness of a servant, of this particularly interesting valve since it was returned to me by the artist.

Section M.

Neæra fragilissima, n. sp. (Pl. IX. figs. 1–1*b*).

Testa magna, tenuissima, ovata, postice breviter rostrata, globosa, haud nitida, alba, inæquilateralis, liris radiantibus tenuibus instructa, incrementique lineis striata. Margo dorsi anticus altus, supra umbones productus, posticus paulo excavatus. Latus anticum superne obliquum, parum arcuatum, ad extremitatem subacute rotundatum. Margo ventralis late curvatus, postice sub rostro leviter sinuatus. Rostrum breve, liris radiantibus obsoletis ornatum, superne pone umbones aream angustam impressam exhibens. Umbones postmediani, ad apicem acuti, paulo supra marginem producti. Valva dextra postice vix dentata. Pagina interna parum nitida, radiatim sulcata et striata.

This species is excessively fragile, rather large and inflated, inequilateral, ovate-rostrate, not glossy exteriorly, white, and sculptured with numerous fine radiating

ridges, of which those upon the surface between the middle of the valves and the commencement of the rostrum are thicker than the rest, those upon the beak itself being almost obsolete. In addition, it is ornamented with the lines of growth, which, in some places, are so strong as to produce a slightly cancellated appearance. The front dorsal margin is much elongated and a little curved, the posterior, on the contrary, being slightly concave and just a trifle oblique. The anterior end is obliquely sloped above, with a very small curve, and terminates in a moderately sharply rounded extremity. The ventral outline forms a broad curve except beneath the rostrated end, where it is feebly sinuated. The beak is broad, rather short, curvedly truncate at the end, and exhibits above, a narrow, slightly sunken dorsal area. The umbones are moderately large and acute, recurved, somewhat raised above the hinge-line, and located rather in advance of the centre. The hinge might be said to be toothless, although in the right valve there is a very insignificant ridge, starting from the ligament-pit and continued a little way parallel with the posterior dorsal margin, which might be regarded as an incipient lateral tooth. The ligament is small, short, and oblique, inclining towards the anterior end. The interior is not very glossy, but exhibits radiating grooves and striæ corresponding to the external ridges and lirae. The hinder muscular scar is more distinct than the front one, and bordered anteriorly by a thickened ridge.

Length 20 mm., height 12, diameter 9.

Habitat.—Off Prince Edward Island, in 300 fathoms.

This is a large and very fragile species, in many respects similar to *Nucula curta*, Jeffreys. It is perhaps a little longer in proportion to the height, has more distinct lirae on the anterior half of the surface, a narrow sunken dorsal area, and lacks the "short strong triangular lateral" tooth on the posterior side of the right valve which occurs in that species.

Poromya, Forbes.

Poromya australis, n. sp. (Pl. XI. figs. 2–2*b*).

Testa parva, æquilateralis, tenuis, albida; margo dorsi utrinque valde declivis, antice concaviusculus, postice leviter convexus. Valva dextra mediocriter convexa, in regione lunulari concave depressa, prope marginem dorsalem posticum carinata, undique granulata, granulis confertis, erectis, in quincuncibus digestis. Umbo prominens, ad apicem levigatus, antrorsum versus. Dens cardinalis unicus validus, erectus, infra apicem locatus. Pagina interna alba, nitida, leviter margaritacea.

Only a single right valve of this species was obtained. It is about as long as high, rounded at both ends, and along the ventral margin it is more gently curved. It is

thinnish, equilateral, moderately convex, white, and ornamented with innumerable minute elevated granules arranged in quincuncial fashion. The dorsal margin is considerably oblique on both sides of the prominent beak which is well curved over towards the front, and smooth and glossy at the tip, in front of which there is a lunular depression, which is not, however, defined by a line. The anterior dorsal slope is a trifle concave, the posterior side, on the contrary, being slightly convex, exhibiting a sharpish keel or ridge very close to the edge, marking off a linear dorsal area. The single cardinal tooth is large, strong, erect, and situated immediately beneath the apex of the umbo. The interior of the valve is whitish and somewhat pearly.

Length $4\frac{2}{3}$ mm., height $4\frac{1}{2}$, diameter of valve $1\frac{2}{3}$.

Habitat.—Station 185B, east of Cape York, North Australia, in 155 fathoms; coral sand.

This is a shorter shell than the European *Poromya granulata* of Nyst, with more sloping dorsal margins and a more curved ventral outline. It is also more coarsely granulated, and the pit containing the internal ligament is smaller and more equilaterally triangular.

Poromya lævis, n. sp. (Pl. XI. figs. 3–3*b*).

Testa inæquilateralis, ovata, antice paulo acuminata, postice latior, leviter subtruncata, alba, tenuis, nitida, incrementi lineis levibus striata, undique microscopice subpunctata. Margo dorsi utrinque declivis, postice subrectilinearis, antice leviter excurvatus, prope umbonem contractus, lunulam parvam concavam formans. Margo ventris late arcuatus. Umbones parvi, paulo supra marginem dorsalem producti, aliquanto post medium siti. Valva dextra dente unico subvalido infra umbonem instructa, lineaque cardinis antice profunde sulcata. Proxime sub margine dorsali pone umbonem est ligamenti sulcus parvus haud profundus. Pagina interna nitida, submargaritacea, radiatim substriata.

Of this species only three right valves are at present known. It is of an ovate form, a little acuminate in front, broader and somewhat truncated behind. It is not very convex, rather inequilateral, the anterior side being the longer. It is thinnish, white, glossy, sculptured with very fine lines of growth, and everywhere exhibits a microscopic shagreened surface, only visible under a compound lens. The front dorsal margin is a little curved and sloping, the posterior being shorter, straighter, and more oblique, and turned at right angles to the rest of the valve, forming a narrow dorsal area. The ventral outline is regularly and widely arcuate, ascending equally at both ends. The beaks are small, slightly raised above the hinge-line, are situated behind the centre, and curve towards the front over a small concave lunule. The interior is glossy, semipearly, and finely radiately substriated, especially towards the lower margin. There

is a single strongish tooth in the right valve just beneath the umbo, with a large deep triangular excavation behind it, the hinge-plate being rather deeply grooved on the anterior side. Immediately under the dorsal margin, a little behind the beak and above the triangular excavation mentioned above, there is a small shallow elongate pit, no doubt for the reception of a small internal ligament. The muscular impressions are indistinct.

Length 7 mm., height 5⅓, presumed diameter of a perfect specimen 4.

Habitat.—Station 185B, east of Cape York, North Australia, in 155 fathoms; coral sand.

Although not minutely granulated like the typical forms of *Poromya*, still, in the composition of the hinge, this species, so far as one can judge from right valves only, accords with that genus. The interior has a similar semipearly character, and is radiately substriated, so that the location is probably correct.

Subfamily Myinæ.

Mya, Linné.

Mya sp.

Habitat.—Flinders Passage, Torres Strait, in 7 fathoms.

Only a minute left valve of a species of *Mya* was obtained at this locality. It is not unlike *Mya japonica* in outline, and possibly it may be the young of that form. As no species of the genus has been recorded from this district, its occurrence may be worthy of mention.

Family Mactridæ.

Subfamily Lutrariinæ.

Raeta, Gray.

Raeta pulchella, (Adams and Reeve).

Poromya pulchella, Adams and Reeve, Zool. Voy. Samarang, p. 83, pl. xxiii. fig. 1.
Raeta pulchella, H. and A. Adams, Gen. Moll., vol. ii. p. 386.
Mactra rostralis, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 69.
Mactra rostralis, Reeve, Con. Icon., vol. viii. pl. xxi. fig. 119.

Habitat.—Off Yokohama, in 8 to 14 fathoms; and Station 233C, off Japan, in 12 fathoms.

This species was originally described from specimens dredged off the shores of Borneo, and again as *Mactra rostralis*, from Japanese examples. It is more elongate than the young of the American *Raeta canaliculata*, and somewhat more equilateral.

Subfamily Mactrinæ.

Mactra, Linné.

Mactra (Mactrinula) plicataria, Linné.

Mactra plicataria, Linné, Syst. Nat., ed. 12, p. 1125.
Mactra plicataria, Chemnitz, Conch.-Cab., vol. vi. p. 213, pl. xx. figs. 202–204.
Mactra plicataria, Reeve, Con. Icon., vol. viii. fig. 26.
Mactra (Mactrinula) plicataria, Kobelt, Illust. Conch., p. 324, pl. xciii. fig. 8.
Mactrinula plicataria, H. and A. Adams, Genera, vol. iii. pl. xcix. figs. 2, 2*a*.
Mactrinula plicataria, Chenu, Manuel Conch., vol. ii. p. 55, fig. 226.

Habitat.—Cape York, North Australia, in 3 to 12 fathoms (Challenger); Java (Linn.); Sumatra (Reeve); Tranquebar (Chemnitz).

Only a single small specimen about half an inch in length was obtained. This is not quite typical, having the concentric riblets more or less obsolete, except down the anterior side, in this respect more like *Mactra lævis*, Chemnitz, which I believe is another form of this species.

Mactra (Mactrinula) depressa, Reeve.

Mactra depressa (?Spengler) (*teste* Reeve), Skrivt. af Naturhist. Selskabet, 1799, vol. v. p. 118.
Mactra depressa, Reeve, Conch. Icon., vol. viii. fig. 67.
Mactra oralina, Reeve (?Lamarck), Conch. Icon., fig. 66.

Habitat.—Port Jackson, in 2 to 10 fathoms (Challenger and G. F. Angas); also Port Philip (Angas and Brit. Mus.).

I see no sufficient reason for separating the above two forms. Probably Reeve was influenced by the localities attached to the specimens in Cuming's collection. "West Columbia" I merely regard as one of the numerous geographical errors which occur throughout that collection, many of which unfortunately have found their way into print in the works of Reeve and Sowerby. *Mactra angulifera*, Deshayes, is scarcely sufficiently distinct to warrant its specific separation. The figure in Delessert's Recueil, pl. iii. figs. 7*a*, *b*, is a very differently shaped shell to that represented in the Conchologia Iconica.

I have little doubt that Reeve's identification of this species with the *Mactra depressa* of Spengler is incorrect. It is described by the latter author as having a sulcated lunule and a lineated area ("vulva arcuata, sulcata, ano lineato"). It is also characterised as equilateral, the posterior carinæ are not mentioned, and it is said to come from the coast of Guinea. The name "*depressa*" has been subsequently employed by Deshayes for a fossil species (Coq. foss. de Paris, vol. i. p. 32).

Mactra incarnata, Deshayes.

Mactra incarnata (Deshayes), Reeve, Conch. Icon., vol. viii. fig. 61.
Trigonella incarnata, H. and A. Adams, Genera Rec. Moll., vol. ii. p. 376.
Trigonella incarnata, Tryon, Amer. Journ. Conch., vol. iii., Appendix, p. 37.

Habitat.—Station 212, south of the Philippine Islands, in 10 fathoms; sand.

This species was described from specimens said to have been obtained at Swan River. Only six small not half-grown valves were collected by the Challenger at the above locality. At this age they appear rather more trigonal than when adult, and exhibit more rosy radiation in the interior of the valves. The species is closely related to *Mactra eximia* of Deshayes, which, however, is a somewhat higher shell, having a more strongly curved basal margin and somewhat coarser sulci on the lateral areas.

There are three or four species which are characterised with similar lateral grooving, and border rather closely on the present form. Among these may be mentioned *Mactra semistriata*, Deshayes, *Mactra eximia* (already referred to), *Mactra antiquata*, Spengler, and *Mactra mera*, Deshayes, the two last being unquestionably one and the same shell. The distinction between those and other closely allied forms of *Mactra* may be very trifling, still they appear fairly constant, each locality producing its variety.

Mactra isabelleana, d'Orbigny.

Mactra isabelleana, d'Orbigny, Voy. Amérique Mérid., vol. v. p. 509; Atlas, vol. ix. pl. lxxvii. figs. 25, 26.
Mulinia isabelliana (d'Orbigny), Tryon, Amer. Journ. Conch., vol. iii., Appendix, p. 31.

Habitat.—Station 321, off Monte Video, in 13 fathoms; mud.

D'Orbigny says that this species is found at all points near the mouth of the River Plate at Maldonado, at Monte Video, and on the opposite coast at Cape San Antonio.

It is a moderately solid shell, a little inequilateral, somewhat trigonal, and generally more acute posteriorly than in front. It is of a whitish-brown colour, and more or less covered with a yellowish-olive epidermis. The surface of the valves is sculptured by concentric striæ of growth, and generally exhibits, here and there, stronger grooves and elevations, which may indicate periods of arrested increase. The pallial sinus is subject to some variation, in some instances being deeper than in others, but it never apparently extends nearly half-way across the valves. The external ligament is minute, situated above the internal cartilage, and is separated from it by a narrow shelly partition.

Mactra achatina, Chemnitz.

Mactra achatina, Chemnitz, Conch.-Cab., vol. xi. p. 218, pl. cc. figs. 1957, 1958.
Mactra achatina, Reeve, Conch. Icon., vol. viii. pl. xii. fig. 51.
Mactra maculosa, Lamarck, Anim. Sans Vert., ed. 2, vol. vi. p. 100.
Mactra maculosa, Hanley, Cat. Rec. Shells, pp. 29 and 310, pl. xi. fig. 27.
Mactra ornata, Gray, Ann. and Mag. Nat. Hist., 1837, vol. i. p. 371.
Mactra ornata, Reeve, *loc. cit.*, pl. xiii. fig. 58.

Habitat.—Admiralty Islands, in 16 to 25 fathoms (Challenger); Philippine Islands (Reeve), Ceylon, and Nicobar Islands (Chemnitz); var. *ornata*, China (Gray); Ceylon (E. W. H. Holdsworth in Brit. Mus.).

Among the synonymy of this species given by Reeve and copied by Conrad (Amer. Journ. Conch., vol. iii., Appendix, p. 35) I find mentioned *Mactra maculata* as of Hanley. The species referred to by the latter author is not the *Mactra achatina*, but the true *Mactra maculata* of Chemnitz, which is a very different shell. It is figured by Reeve, Conch. Icon., fig. 56, and again as *Mactra reevei*, Deshayes, on pl. xvi. fig. 85.

The *Mactra ornata* of Gray I regard as the typical form of this species, and the shell figured by Reeve (fig. 51) as a variety. Specimens in the British Museum from Ceylon, one of the localities mentioned by Chemnitz, agree better as regards colour and form with the figure and description in the "Conchylien-Cabinet" than those from the Philippine Islands and Admiralty Islands.

Mactra incerta, n. sp. (Pl. V. figs. 7–7*c*).

Testa mediocriter convexa, ovato-subtrigona, paulo inæquilateralis, tenuiuscula, nitida, levigata, utrinque umbones versus radiatim sulcata, albida, radiis latis interruptis fuscis variegata. Margo dorsi anticus elongatus, oblique leviter convexus, posticus valde declivis, parum arcuatus; margo inferior late curvatus. Umbones acuti, ad apicem fuscescentes, paulo post medium collocati. Cardo albus, dentibus lateralibus gracilibus munitus. Pagina interna nitida, coloribus externis tincta. Sinus pallii mediocris, rotundata.

This little species has the anterior side rather longer than the posterior, the former being narrowed towards the end, where it is sharply rounded, and the latter broader, obliquely subtruncate, terminating in a rounded angle at the base. It is a thinnish shell, rather glossy, with very little sculpture upon the greater portion of the surface, but rather strongly grooved laterally on both sides of the beaks. The ground-colour is whitish, copiously stained with brown in the form of broad interrupted rays which are faintly obscured by an excessively thin epidermal film. The front dorsal margin is a little convex and descends obliquely, the posterior also being slightly excurved, but much

more suddenly sloping. The lower outline is very gently curved, rising rather higher in front than behind. The beaks are small, brown at the tips, placed a little behind the centre, and raised a trifle above the hinge-line. The hinge-plate and the teeth, including the slender laterals, are white. The interior is somewhat glossy, of the same colour as the exterior, showing a pallial sinus, sharply rounded at the end, and reaching a little more than a third of the length across the valves.

Length 15 mm., height 10, diameter 7.

Habitat.—Admiralty Islands, north-east of New Guinea, in 16 to 25 fathoms.

The single specimen under examination may not represent the adult state of this species; but, judging from its general appearance and the somewhat thickened inner margin of the valve, I am of opinion that it does not attain a large size. It must not be confounded with the young of *Mactra achatina*, also met with at the same locality. That species has the hinder portion of the valves longest, and lacks the strong grooving on each side of the umbones.

Mactra decora, Deshayes.

Mactra decora, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 63.
Mactra decora, Reeve, Conch. Icon., vol. viii. fig. 80.

Habitat.—Banda Island.

A single specimen from this locality may possibly be the young form of this species, although I hesitate to affirm positively that such is the case. The species attains a larger size than the example figured by Reeve, a specimen in the Cumingian collection having a length of 57 mm.

Mactra pusilla, A. Adams (Pl. V. figs. 8–8*c*).

Mactra pusilla, A. Adams, Proc. Zool. Soc. Lond., 1855, p. 226.

Testa ovato-trigona, fere æquilateralis, utrinque subacuminata, tenuis, dilute cæruleo-alba, radiis olivaceo-fuscis numerosis plus minusve distinctis ornata. Umbones mediani, acuti, purpurascentes. Area dorsalis utrinque alba, fusco marginata. Valvæ nitidæ, incrementi lineis tenuibus striatæ, utrinque marginem dorsalem versus subfortiter et confertim sulcatæ. Margo dorsi anticus valde declivis, paulo convexus, posticus aliquanto convexior, subæqualiter obliquus. Ventris margo regulariter late arcuatus. Pagina interna livido-purpurascens, prope umbones cæruleo-albida, marginem inferiorem versus dilute fuscescens vel cervina. Pallii sinus mediocriter profundus, vix ad medium attingens, ad extremitatem acute rotundatum.

This is a thinnish species, nearly equilateral, ovately trigonal, longer than high, somewhat acuminate at both ends, more especially posteriorly. It is rather glossy, very finely striated by lines of growth, and sculptured on both sides beneath the dorsal line with somewhat strong sulci, which become gradually coarser as the shell increases. The general tone of the valves is light fawn, varied with numerous narrow olive-brown rays, and purple tips to the umbones. The dorsal area has a lanceolate white space in front of the beaks, and a narrower one behind them, which are bordered with a brownish colour. The dorsal margin is very oblique and only slightly curved in front, but rather more arched and about equally sloping behind. The lower outline is regularly and broadly arcuate, forming anteriorly with the upper slope a rather sharply rounded extremity, the opposite end being roundly angulated. The interior of the valves is livid purplish, paler towards the margin, which is fawn coloured, and bluish-white beneath the umbones. The hinge-plate and the teeth are white. The pallial sinus moderately deep, somewhat sharply rounded at the end, and does not reach quite half-way across the valves.

Length 31 mm., height 21, diameter 12½.

Habitat.—Brisbane water, Queensland, dredged at a depth of 5 fathoms on a sandy and shelly bottom by J. Macgillivray during the voyage of the "Rattlesnake;" also Port Jackson, New South Wales, in 4 to 18 fathoms (Challenger); Moreton Bay (A. Adams).

This is possibly the species referred by Angas[1] to *Mactra luzonica* of Deshayes, to which it is very closely related. That species is, however, a somewhat thicker shell, a trifle more elongate, having the hinder side rather longer than the anterior, whilst, in the present species, the latter portion is slightly the larger. It is more strongly striated, especially towards the anterior end, where the valves are distinctly concentrically sulcate. It is also almost totally devoid of radiating markings, has no whitish mark beneath the umbones in the interior, and has a smaller and shorter pallial sinus. It is said to have been found at the Island of Luzon, and specimens were collected on the coast of Arakan by W. T. Blanford, Esq., who liberally presented a set, together with a very valuable collection of shells from that country, to the British Museum.

The types in Cuming's collection found at Moreton Bay by Mr. Strange are young shells, and of a paler tint than more adult specimens. The interior also lacks the livid purplish colour so characteristic of the full-grown shell, and the beaks are paler than usual. In all other respects there is no difference, the form, sculpture, hinge and pallial sinus corresponding exactly with the larger specimens from Port Jackson and Brisbane. But little attention must be paid to the colours ascribed to this species by its describer, for I was once informed by Mr. G. F. Angas that Mr. A. Adams was colour-blind.

[1] *Proc. Zool. Soc. Lond.*, 1867, p. 916.

Mactra jacksonensis, n. sp. (Pl. V. figs. 9–9*b*).

Trigonella pusilla, Angas (*non* A. Adams), Proc. Zool. Soc. Lond., 1867, p. 916.

Testa parva, paulo inæquilateralis, triangularis, albida, radiis paucis fuscis plus minusve distinctis ornata, tenuis, nitida, striis concentricis tenuibus sculpta. Margo dorsi utrinque valde declivis, vix arcuatus vel subrectus; margo ventris late arcuatus, parum ascendens. Cardo angustus, dentibus gracilibus munitus. Pallii sinus parvus, minime profundus.

This species is of small size, triangular, considerably acuminate behind, and rather more obtusely rounded in front. It is a little inequilateral, the posterior side being a trifle longer than the anterior. It is thin, glossy, finely concentrically striated, the striæ being about as fine at the sides as on the centre of the valves. It is whitish, varied with about six more or less distinct brownish rays. The dorsal margins are almost rectilinear, and rather sloping, especially the posterior, which is a trifle longer than the anterior. The umbones are small, acute, white, and defined on each side by brownish rays. The interior of the valves is very similar in colour to the exterior, and exhibits a very small delicate hinge and a very shallow pallial sinus, extending only about one fourth of the length across the valve.

Length 14½ mm., height 10½, diameter 6.

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms.

This species must not be confounded with the young form of *Mactra pusilla*. It may easily be distinguished by the following differences. It is more acute behind and has the posterior side longer than the anterior, whilst in *Mactra pusilla* the relative sizes are reversed. The present species too has pale umbones, also lacks the conspicuous sulci on each side upon the dorsal areas, and has a smaller pallial sinus.

Family Anatinidæ.

Subfamily Pandorinæ.

Calodon, Carpenter.

Cælodon elongatus, Carpenter.

Cælodon elongatus, Carpenter, Proc. Zool. Soc. Lond., 1864, p. 600.
Calodon elongatus, Carpenter, Moll. West. N. Amer., p. 229.

Habitat.—Flinders Passage, North Australia, in 7 fathoms.

The shells originally described by Carpenter were from China and Borneo. The single specimen from the above locality differs in one or two points which are not, I consider, of specific importance. The hinder portion of the dorsal line is rather less

incurved, the anterior less oblique, and the left valve has a slight keel extending a short distance obliquely from the umbones which does not occur in the three specimens examined by Carpenter. These differences probably would not prove constant could we study a large number of examples. In its excessive flatness and the character of the hinge it perfectly corresponds with this species. *Calodon delicatulus*,[1] a Japanese species, has a similar umbonal ridge, but is rather different in form, and has another description of hinge.

Myochama, Stutchbury.

Myochama anomioides, Stutchbury.

Myochama anomioides, Stutchbury, Zool. Journ., vol. v. p. 97, Tab. Suppl. 42, figs. 1–4.
Myochama anomioides, Hancock, Ann. and Mag. Nat. Hist., 1853, vol. xi. p. 287, pl. xi. (animal).
Myochama anomioides, Chenu, Man. Conch., vol. ii. p. 52, fig. 219.
Myochama anomioides, Woodward, Man. Moll., pl. xxiii. fig. 13.
Myochama anomioides, Reeve, Conch. Icon., fig. 4*c* only.
Myochama keppelliana, A. Adams, Proc. Zool. Soc. Lond., 1852, p. 90, pl. xv. fig. 1.
Myochama keppelliana, Reeve, Conch. Icon., fig. 2.

Habitat.—Port Jackson on *Pectunculus holosericus* and *Trigonia lamarckii*, in 2 to 10 fathoms; also at Station 162, off East Moncœur Island, Bass Strait, in 38 fathoms; sand and shells; on *Pectunculus beddomei*.

I do not find any good characters distinguishing Stutchbury's *Myochama anomioides* and the *Myochama keppelliana* of A. Adams, and I am also inclined to think that another set of species so-called, namely, *Myochama stutchburyi*, A. Adams, *Myochama tabida*, Reeve, and *Myochama transversa*, A. Adams, merely differ from the rest in having the radiating costæ finer. I feel, however, no hesitation in pronouncing the three last mentioned forms as one and the same. The remaining species, *Myochama strangei* of A. Adams, is a very distinct shell from any of those mentioned above, having a peculiarly wrinkled and malleated surface, and moreover of a different colour. I would here remark that Reeve is totally wrong in placing *Myochama transversa* as a synonym of *Myochama strangei*, the latter being correctly figured on Pl. I. fig. 1*b*.

The type of *Myochama transversa* still preserved in the Cumingian collection, does not appear in Reeve's Monograph, but was first of all figured in the Proc. Zool. Soc. Lond., 1850, pl. viii. fig. 1, the drawing being enlarged, and subsequently in the same work for 1852, pl. xv. fig. 3, this figure representing the specimen of its natural size. I do not agree with Reeve in considering the right hand specimen of figure 3 on his plate distinct from the shell on the left, both in my opinion being forms of *Myochama transversa*, also represented by figs. 4*a* and 4*b*, *Myochama anomioides* being delineated by fig. 4*c* only.

[1] (A. Adams, MS., Carpenter, *Proc. Zool. Soc. Lond.*, 1864, p. 660.

Myodora, Gray.

Myodora pandoriformis, (Stutchbury).

Anatina pandoriformis, Stutchbury, Zool. Journ., vol. v. p. 99, Tab. Suppl. 43, figs. 3, 4.
Myodora pandoriformis, Hanley, Descrip. Cat. Rec. Biv. Shells, pl. x. fig. 9.
Myodora pandoriformis, Smith, Proc. Zool. Soc. Lond., 1880, p. 581.
Myodora pandoraeformis, Reeve, Conch. Icon., fig. 10; Proc. Zool. Soc. Lond., 1844, p. 93.
Myodora brevis, H. and A. Adams (*non* Sowerby), Gen. Rec. Moll., vol. iii. pl. xcviii. figs. 2, 2*a*.

Habitat.—Port Jackson, Sydney, 2 to 10 fathoms (Challenger, Stutchbury, and Macgillivray); Middle Harbour (Angas); Sydney Heads, 15 fathoms (Brenchley); Port Philip (Brit. Museum).

This species is easily recognised from the rest of the genus by its transversely elongate form, its comparative smoothness, and the excessive fineness of the microscopic sculpture.

Myodora brevis (Sowerby).

Pandora brevis, Sowerby, Appendix to Stutchbury's Sale Catalogue, p. 3, pl. fig. 2.
Anatina brevis, Stutchbury, Zool. Journ., vol. v. p. 99, Tab. Suppl. 43, figs. 1, 2.
Myodora brevis, Reeve, Proc. Zool. Soc. Lond., 1844, p. 93.
Myodora brevis, Reeve, Conch. Icon., figs. 7*a*, *b*.
Myodora brevis, Hanley, Cat. Rec. Biv. Shells, pl. x. fig. 13.
Myodora brevis, Chenu, Man. Conch., vol. ii. p. 52, fig. 217.

Habitat.—Port Jackson, Sydney, 2 to 10 fathoms (Challenger, Stutchbury, and Brenchley); Lane Cove, Farm Cove, and Mossman's Bay (Angas); Cape Upstart (Mus. Cuming); New Zealand, Stewart Island, and Tasmania (Brit. Mus.).

The *Myodora brevis* of Woodward's Manual of Mollusca, pl. xxiii. fig. 12, is the *Myodora striata* of Quoy and Gaimard, and Messrs. H. and A. Adams' identification of this species (Gen. Rec. Moll., vol. iii. pl. xcviii. figs. 2, 2*a*) is also incorrect, the shell there delineated being *Myodora pandoriformis*. In my Monograph of this genus[1] I observe that the form of this species is subject to considerable variation. This may be seen by comparing the figure in the Stutchbury Sale Catalogue with that in the Zoological Journal. The series of specimens in the British Museum, too, indicates how variable this species is with regard to outline, the apical angle in some being much more acute than in others. The microscopic sculpture consists of a very minute granulation, the granules being of unequal sizes, and frequently transversely oblong. This granulation is coarser than in the other species of the genus, and the almost total absence of the radiating microscopic lines in all of them is remarkable. The Tasmanian specimens are peculiar on account of the greater coarseness of the concentric raised ridges;

[1] *Proc. Zool. Soc. Lond.*, 1880, p. 580.

but in other respects they agree with the normal Australian form, except that the umbonal angle is rather less acute.

Myodora crassa (Stutchbury).

Anatina crassa, Stutchbury, Zool. Journ., vol. v. p. 100, Tab. Suppl. xliii. figs. 5, 6.
Myodora crassa, Reeve, Proc. Zool. Soc. Lond., 1844, p. 92.
Myodora crassa, Reeve, Conch. Icon., fig. 1.
Myodora crassa, Hanley, Rec. Biv. Shells, pl. x. fig. 6.
Myodora crassa, Smith, Proc. Zool. Soc. Lond., 1880, p. 581.

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms (Challenger, Stutchbury, Macgillivray, King); Middle Harbour (Angas).

Only one not quite full-grown right or deep valve was obtained by the Expedition. The species, although small, is remarkable for its solidity, and the less flattened character of the flat or left valve. The microscopic sculpture is fairly coarse, the radiating striæ being well marked. In addition to the single valve above mentioned, I have since discovered three very small odd valves which possibly may be the young state of this species. I find in them two differences, namely, a larger pallial sinus and no lateral dental grooves in the right valves. Considering, however, the modifications in the hinges of some bivalve shells resulting from age, I think it very possible that these differences in the present instance may arise from a like cause.

Myodora trigona, Reeve.

Myodora trigona, Reeve, Conch. Icon., fig. 2; Proc. Zool. Soc. Lond., 1844, p. 92.
Myodora tincta, Reeve, Conch. Icon., fig. 5; Proc. Zool. Soc. Lond., 1844, p. 93.

Habitat.—Flinders Passage, North Australia, in 7 fathoms.

A single left valve from this locality differs from the type from the Philippine Islands merely in having the dorsal margins convergent at a rather less acute angle, so that the form becomes rather more oblong, and a right valve is still less angular and partakes of the form of an adult *Myodora oblonga*, Reeve. This species may only be the young form of a variety of that species, being mainly distinguished by rather finer concentric sculpture.

Myodora sp.

Testa valva sinistra subæquilaterali, triangulari, latere antico acute angulato, postico oblique truncato, leviter concava, sulco prope marginem dorsi posticum exarata, concentrice sulcata, interstitiis subrotundatis, pone sulcum radiantem obsoletis, undique microscopice

interruptim concentrice striata. Margo dorsi utrinque valde descendens, subæqualis, posticus rectilinearis, anticus levissime convexus. Margo ventralis late arcuatus, postice vix adscendens. Sinus pallii arcuatus, minime profundus. Pagina interna sulco radianti unico notata.

There is but a single left or flat valve of this species in the collection. It is triangular, nearly equilateral, acute in front, shortly truncated posteriorly, a little concave, concentrically grooved and ridged, the ridges being nearly obsolete behind an impressed ray which runs from the acute umbo to the lower angle of the hinder truncation. The dorsal margins are about equal in length, and converge at an angle of about 60°. The hinder is quite rectilinear, except just behind the umbo, where there is the faintest incurvation, the anterior being, on the contrary, slightly excurved. The lower margin is widely arcuate, a little up-curving in front, and scarcely at all at the opposite end. The internal surface is glossy, porcellanous, and marked with a single radiating groove, extending from near the acute recurved beak to the side of the shallow sinus in the pallial line.

Length 7 mm., height $5\frac{1}{2}$.

Habitat.—Flinders Passage, Cape York, North Australia, in 7 fathoms.

The single valve here described approaches *Myodora trigona*, Reeve. It is, however, distinguished by the longer straight posterior dorsal slope, greater concavity of the surface, and the more pronounced radiating groove.

Myodora sp.

Testa elongata, tenuis, paulo inæquilateralis. Valva dextra mediocriter convexa postice pone porcam radiantem ab umbone ad extremitatem posticam decurrentem aliquanto excavata, concentrice lirata, latere, antico rotunde subangulato, postico oblique truncato. Margo dorsi anterior obliquus, fere rectus, posticus paululum longior, leviterque concavus, declivis. Margo ventralis latissime arcuatus. Sinus pallii modice profundus, apice subacuto.

Only two right valves of this species were obtained. They are very elongate, thin, a little inequilateral, finely and subdistantly costate, the ridges disappearing at the arcuate angulation which marks off a small depressed portion of the surface at the hinder end. The dorsal margins are subequally oblique, and form at the umbo an angle of about 65°. The posterior is slightly the longer, and a little concave, the anterior being nearly rectilinear.

The lower margin is very gently curved, and forms with the dorsal slope an acutely rounded anterior extremity, the opposite end being broadly truncate in a slightly oblique

direction. The microscopic sculpture is finer at the extremities than on the central portion of the valves, where the radiating striæ are clearly developed. The umbo is acute, directed towards the hinder end, and curves over towards the left valve. The pallial sinus is fairly deep and acutely rounded at the end, and is touched by an impressed ray descending from the beaks. The hinder muscular scar is circular, rather high up, and larger than the anterior, which is a trifle lower down and subpyriform. The hinge-line and ligament pit are normal.

Length $6\frac{1}{2}$ mm., height $4\frac{1}{2}$.

Habitat.—Stations 187 and 188, both in the region of Torres Strait, North Australia, at depths of 6 and 28 fathoms.

This species is even more elongate than *Myodora oblonga*, in addition to which it is more finely ridged and less acutely beaked at the apex. *Myodora pandoriformis* is also shorter and more finely microscopically sculptured.

Myodora australica (Reeve).

Thracia australica, Reeve, Conch. Icon., fig. 13.
Thracia noro-zelandica, Reeve, Conch. Icon., fig. 19.
Thracia noro-zelandica, Hutton, Manual Moll. New Zealand, p. 136.

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms (Challenger); Moreton Bay (Reeve); Port Jackson (Angas and Voyage of the "Rattlesnake," in the British Museum).

This, like all the species of the genus, is inequivalve and white, and sculptured with microscopic concentric striæ which are interrupted by others radiating irregularly from the umbones, producing a shagreened surface. It is much longer than high, somewhat trigonal, acuminate anteriorly, and truncated behind. The right valve is moderately convex and larger than the left, which is much flatter. Both are marked with subplicate lines of growth, and have a slight arcuate angle running from the beaks to the lower posterior extremity, behind which the surface is somewhat concave. The front dorsal margin is elongate, moderately sloping, and very slightly arcuate, the posterior being not quite so oblique, shorter, a little excavated near the umbones, and then straightish. The ventral outline is very gently curved, forming a rounded angle at its junction with the posterior side, and joining the anterior dorsal slope in a sharp curve. The umbones are acute, and the area is lanceolate, excavated, and defined by slight ridges. The dorsal margins of the left (flattened) valve are acute, but at right angles to the rest of the surface, and act as lateral teeth, fitting into corresponding grooves in the other valve. The ligamental scar beneath the beaks is narrow, rather small, moderately deep, and slopes a little towards the posterior end. The anterior scar is long and narrow, the hinder one being shorter and irregularly rounded. The sinus in the pallial line is large, deeper than high, rounded at the end, and not extending to the centre of the valves. The internal

surface is dull, roughish, or minutely subgranulated about the middle, smoother, more shining, and radiately substriated towards the ventral margin.

Reeve recognised the general outward resemblance of this form to *Myodora*, and it is to be regretted that he did not, before describing it, examine the hinge. Had he done so he would at once have perceived that it did not correspond with that of *Thracia*, but in reality was truly Myodoroid. His conjecture that his *Thracia novo-zelandica* might possibly be a variety of *Thracia australica* is confirmed by the fact that it also proves to belong to *Myodora*, and the locality "New Zealand" has yet to be confirmed, for, so far as at present known with absolute certainty, the species appears to be limited to New South Wales and Queensland.

Myodora angustata (Angas).

Aticia angustata, Angas, Proc. Zool. Soc. Lond., 1867, p. 908, pl. xliv. fig. 1.

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms.

At present I see no grounds for separating this species and *Alicia*[1] *elegantula*, Angas, generically. Both species have the left valve smaller than the right, are white, truncated posteriorly, and sculptured microscopically as in all the species of *Myodora*. The composition of the hinge in both proves to be identical, and the pallial line is sinuated. The more elongate form and the fact of the left valve being rather more convex than in most other species are not in my judgment characters of any importance from a generic point of view.

Subfamily Thracinæ.

Thracia, Leach.

Thracia meridionalis, n. sp. (Pl. VI. figs. 4–4*b*).

Testa paulo inæquilateralis, modice convexa, ovato-oblonga, postice truncata, carinam obsoletam ab umbonibus ad extremitatem posticam exhibens, sordide albida, lineis incrementi rugosis, striisque tenuibus concentrice sculpta, undique minute grano-scobinata: margo dorsi antice valde declivis, aliquanto arcuatus, postice brevior, minus descendens, rectiusculus; margo ventris levissime excurvatus, utrinque parum adscendens. Latus anticum rotundatum, posticum oblique, vix arcuatim truncatum. Cardo, cicatrices et sallii sinus fere ut in *Thracia truncata* (Brown).

This species is of an oblong form, rounded in front and squarely truncated posteriorly, slightly inequilateral, the anterior side being a trifle the longer. It is moderately

[1] This name was previously employed by Mr. J. Y. Johnson for a remarkable Sea Anemone, *Proc. Zool. Soc. Lond.*, 1863.

convex, depressed or a little concave behind, a faint angulation extending from the umbones to the lower posterior end, thin, dirty whitish, finely concentrically striated, marked with more distinct lines of growth here and there, and everywhere very minutely roughened or subgranulated. The dorsal line is very oblique and moderately arched anteriorly, less descending and rectilinear behind, forming with the side margin, which is almost straight, and slopes inward or towards the middle of the slightly curved lower margin, a rather sharp angle. The hinge is not quite like that of *Thracia truncata* of Brown, the process to which the ligament attaches itself being rather slighter, distinct from, and soldered to the hinge-line. The muscular scars and the sinus in the pallial line are similar.

Length 23 mm., height 19, diameter 10.

Length 23 mm., height 18, diameter $9\frac{2}{3}$.

Habitat.—Royal Sound, Kerguelen Island, in 20 to 60 fathoms; Betsy Cove, in 20 to 25 fathoms; Marion Island, in 50 to 75 fathoms; and Prince Edward Island, in 100 to 150 fathoms.

This is the southern representative of the Greenlandic species *Thracia truncata*, and indeed differs so slightly from it that it is with considerable hesitation I venture to describe it as distinct, being mainly influenced to do so by the difference of locality. It is not so equilateral, has the ventral margin straighter, the posterior end more abruptly truncated, the extremity being at the upper angle, whilst in the boreal form the lower end is usually the most prominent. The hinder dorsal slope in the present species is a little reflexed or bent over in both valves, forming an indistinct area, which in *Thracia truncata* is scarcely traceable. A more tangible difference is in the slighter shelly process which supports the ligament, being, as it were, a separate piece joined on to the hinge-line.

Thracia watsoni, n. sp. (Pl. VI. figs. 5–5*b*).

Testa magna, complanata, fere, æquilateralis, utrinque dorsaliterque aliquanto hians, albida, concentrice fortiter plicato-rugata, scabra, granulata, transversim oblonga, antice rotundata, postice oblique truncata, margine ventrali rectiusculo rotundatim in latum anterius ambiente. Margo dorsi anticus paulo obliquus, vix arcuatus, posticus valvæ dextræ mediocriter concavæ horizontalis, in valva sinistra subplana leviter obliquus, infra umbonem concaviusculus. Umbones parvi, acutissimi, postice inclinati. Area excavata, subacute marginata. Ligamentum externum utroque apicis latere prolongatum, antice in fossula parva marginam intra situm. Cartilago interna magna, triangularis, in receptaculo calloso crasso inclusa. Cicatrix muscularis posterior fere circularis, anterior elongata, irregularis. Pallii sinus profundus, latus, ad apicem rotundatus.

This magnificent large species is much compressed, very elongate, not quite twice as long as high, almost equilateral, rounded in front, obliquely truncated at the opposite

extremity, and gapes somewhat at both ends and along the back. It is dirty whitish, concentrically coarsely plicate-wrinkled, the rugæ being stronger upon the central portion of the valves, becoming more or less obsolete towards the dorsal margin on both sides. The surface or outer shell-layer is everywhere rough to the touch, minutely granular, and produced in the left or flat valve beyond the white shelly interior, forming a broadish buff border composed of a compact tessellation of thousands of the minutest plates as it were soldered together. The dorsal margin is slightly arcuate on the anterior side and somewhat oblique, posteriorly being almost rectilinear, and horizontal in the right or deep valve, but a trifle oblique and concave near the beak in the left. In this valve, on both sides of the umbo, it is turned over abruptly, almost at right angles towards the other valve. The lower outline is straightish along the middle, considerably up-curving in front, and only a little behind, forming with the oblique latter margin a well-rounded corner. The umbones are small, very acute, not at all inflated, and turn towards the hinder end. On this side the dorsal area is excavated at the beaks, where it is rather sharply margined on each side. The external ligament extends on both sides of the umbones, in front having a narrow short groove partitioned off for its reception. The internal cartilage is large, equilaterally triangular, located in a strong shelly process firmly soldered to the valves immediately beneath the beaks, which is unusual. The muscular scars are high up, the posterior being nearly circular, near the dorsal margin, and somewhat remote from the end of the shell. The anterior is in about the same position, elongate, narrow, bent in the middle. The siphonal inflection of the pallial line is deep, broad, rounded at the end, and extends across the valves about five-fourteenths of the entire length of the shell.

Length 58 mm., height 32, diameter 10.

Habitat.—Station 162, off East Moncœur Island, Bass Strait; in 38 to 40 fathoms; sand and shells.

This fine large species is remarkable on account of its flattened compressed character, and being almost equilateral. The ligament-pit is very strong, and the outer epidermal shell-layer is peculiar. I have much pleasure in naming it after my friend the Rev. R. Boog Watson, who is carefully preparing a Report upon the Gasteropoda and Scaphopoda of the Expedition.

Thracia myodoroides, n. sp. (Pl. VI. figs. 6–6*b*).

Testa subcompressa, æquilateralis, aliquanto triangularis, postice late truncata, antice rotunde cuneata, albida, minutissime granulata, incrementi lineis hic illic inconspicuis arata. Margo dorsalis anticus valde obliquus, rectiusculus, vix excurvatus, posticus leviter declivis, rectilinearis. Ventris margo parum arcuatus, antice lente adscendens, cum dorsali acuto-rotundatim junctus. Umbones parvi, acuti, latus versus posticum vix

inclinati. Ligamentum flavum in sulco angusto marginali situm. Sinus pallii latus, arcuatus, haud profundus.

This species is only slightly inequivalve, equilateral, one-third longer than high, moderately convex, irregularly triangular, narrowed in front and broadly truncated posteriorly. The valves are white, very finely granulated throughout, exhibit marks of growth at intervals, and have a rounded angle extending from the umbones to the lower posterior extremity, and another subparallel with the margin which encloses the dorsal area. The dorsal margin is rectilinear posteriorly and nearly so in front, and almost equally oblique on both sides, forming at the apex an angle of about 130°. The anterior end is rather wedge-shaped and rounded at the extremity, the posterior side being squarely truncated, forming rounded angles with the dorsal and ventral margins, the latter being but very little curved and rather more ascending in front than behind. The external ligament is yellowish, and located in a narrow marginal groove behind the beaks. The pallial sinus is broad, arcuate, but not deep. The interior is not very glossy and radiately substriated.

Length 13 mm., height 9½, diameter 5.

Habitat.—Station 162, off East Moncœur Island, Bass Strait, in 38 to 40 fathoms.

This species is rather like *Myodora australica*, Reeve, in respect of form.

Thracia modesta, Angas.

Thracia modesta, Angas, Proc. Zool. Soc. Lond, 1867, p. 908, pl. xliv. fig. 3.

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms.

The left valve of this species is rather shallower than the right. The single valve obtained by the Challenger has the posterior truncated end rather broader than the type figured by Angas, and the lower outline less curved.

Periploma, Schumacher.

Periploma compressa, d'Orbigny.

Periploma compressa, d'Orbigny, Voy. Amér. Mérid., vol. v. p. 514, pl. lxxviii. figs. 19, 20.

Testa transversim ovata, antice late rotundata, postice angustior, breviter acuminata, hians, paulo dextrorsum flexa, valde inæquilateralis, subcompressa, sordide, albida aspera, minute granulata, incrementi lineis striata. Margo dorsi anticus perelongatus, leviter arcuatus et declivis, posticus longe brevior, magis obliquus, primo rectiusculus. Margo ventris late curvatus, postice leviter sinuatus. Umbones parvi, acuti, fissi, circa in ⅓ longitudinis collocati. Ossiculum cardinis ovatum, costa obliqua suffultum. Pagina interna submargaritacea, linea arcuata in valva sinistra ab umbone latum posticum versus radiante notata. Sinus pallii breviter linguiformis ad apicem rotundatus.

This very interesting form is rather compressed, fragile, broadly ovate, rounded in front, narrower and somewhat pouting posteriorly. It is very inequilateral, minutely granulated, striated by concentric lines of growth, dirty whitish, exhibiting traces of a pale earth-coloured epidermis, which is somewhat reflexed within the valves. The valves are about equal in size, bent a little to the right at the posterior end, and gape somewhat at both extremities, especially behind. The front dorsal margin is slightly convex, very long, and only a little oblique, the posterior being very much shorter and rather straight at first, then, descending in a slight curve, joins the obliquely up-curving and slightly sinuated ventral margin at an obtuse point, which is most conspicuous in the left valve. The umbones are small, acute, slit at the apex, and situated at about one-third of the entire length from the hinder end. The cartilage-receiver is more or less ovate, directed obliquely towards the anterior ventral edge, and supported by a shelly ridge. The transverse free ossicle is moderately thick. The interior of the valves is whitish, a little pearly, exhibits the concentric lines of growth, and one or more radiating lines from the beaks down the posterior side, and apparently more conspicuous in the left valve than the right. The pallial sinus is moderately deep, reaching rather more than one-third across the valves, and is sharply rounded at the end.

Length 37 mm., height 28, diameter 13.

Habitat.—Station 321, off Monte Video, in 13 fathoms; mud.

The types described by d'Orbigny were collected a little farther south, near San Blas, in North Patagonia.

Lyonsia, Turton.

Lyonsia formosa, Jeffreys (Pl. VI. figs. 3–3*b*).

Lyonsia formosa, Jeffreys, Proc. Zool. Soc. Lond., 1881, p. 930, pl. lxx. fig. 1.

Habitat.—Station 8, off Gomera, Canaries, in 620 fathoms; sandy mud and shells. (For further distribution, see Jeffreys, *loc. cit.*)

The Challenger specimen is oblong and somewhat quadrate, having two distinct ridges radiating from the umbones, one to the ventral margin at a point a little behind the middle, and the other to the posterior lower extremity, the former being rounded and submodose and the latter even, rather acute, and bearing a series of granules rather larger than those on the rest of the surface. Both ends are gently curved, and the lower outline is a little sinuated on each side of the subcentral carina. Behind the posterior keel the valves exhibit about seven slender feeble radiating ridges, each with a row of granules along the top, which are similar to those upon the carina. Within the valves there are seven corresponding faint furrows which have a subpunctate appearance.

Lyonsiella, M. Sars.

Lyonsiella jeffreysii, n. sp. (Pl. XXV. figs. 1–1*b*).

Testa tenuis, globosa, inaequilateralis, antice recte truncata, postice et inferne arcuata, sordide albida, intus margaritacea, undique minute granulata, lineis gracillimis numerosis radiantibus instructa, striisque incrementi hic illic sublamellatis ornata. Margo dorsi anticus brevis, rectus, horizontalis, posticus longior, declivis, vix excurvatus. Lunula concava, tota in valva dextra. Umbones incurvati, antrorsum versi. Cardo edentulus. Ligamentum internum, callo parvo sustentatum.

This species is thin, convex, inequilateral, a little higher than long, perpendicularly truncated in front, rounded behind and along the ventral margin. The front dorsal line is horizonal and straight, and at the termination forms a sharp angle with the anterior side. The posterior dorsal edge is rather oblique and nearly rectilinear. The valves are dirty whitish, dull, somewhat pearly within, everywhere finely granular, and also sculptured with many (about fifty) fine hair-like raised lines and a few concentric lines of growth at intervals, distinct and almost lamellar. The umbones are somewhat incurved, and directed towards the front. The lunule is concave, smooth, extends to the end of the dorsal margin, and is entirely in the right valve. It projects a little beyond the level of the rest of the margin of the valve, and fits into a slight emargination in the corresponding part of the left valve. The hinge-line is altogether destitute of teeth, and the ligament is internal and supported by a small shelly ossicle underneath. The front adductor scar is high up, just under the front dorsal margin, the posterior one being lower down, at the end of the dorsal slope.

Length 19 mm., height 20, diameter 14.

Habitat.—Station 106, Mid Atlantic, in 1850 fathoms; Globigerina ooze.

The preserved animal of this fine species appears to agree very closely with the description of *Lyonsiella* by Sars in Remarkable Forms of Animal Life, p. 25.

It has a single branchial plume on each side, no labial palps, and a byssiferous foot. The anal and branchial siphonal orifices are distinct, the latter being surrounded by papillæ.

Lyonsiella papyracea, n. sp. (Pl. XXV. figs. 2–2*b*).

Testa magna, tenuissima, alba, rotunde cordata, globosa, liris filiformibus numerosis radiantibus ornata, incrementi lineis tenuibus sculpta, epidermide tenuissima sordide albida induta. Umbones prominentes, antemediani, valde incurvati, antrorsum versi. Linea cardinalis edentula, tenuis. Ligamentum internum, parvum, paulo pone umbones situm, callo crassiusculo suffultum. Pagina interna nitida, submargaritacea, radiatim striata, striis cum liris externis congruentibus.

This fine species is excessively thin, globose, roundly heart-shaped, inequilateral, transparent white, but rendered rather opaque by a thin dirty-white epidermis. The sculpture consists of numerous (about forty) very slender hair-like lines, which radiate from the beaks to the outer margin. They are fairly equidistant, and cover the whole surface with the exception of a small space in front of the umbones. The valves are also very finely striated by the lines of growth, a few at intervals, which apparently mark periods of arrested enlargement, being quite conspicuous. The umbones are large, prominent, well incurved, situated considerably in front of the centre, and inclined over towards the anterior side. The hinge-margin is very thin, and absolutely toothless. The principal ligament is short, entirely internal, attached under the dorsal margin a little behind the umbones, and supported or strengthened underneath by a rather strong callosity, which is rounded beneath, and deeply notched at the hinder end. In addition the valves are connected by a thin ligament along the hinder dorsal edge. The interior of the valves is glossy, somewhat pearly, and feebly radiately grooved, the fine striæ corresponding with the external liræ.

Length 23 mm., height 24, diameter 16.

Habitat.—Station 157, about 1100 miles south-west of Australia, in 1950 fathoms; Diatom ooze.

Of this fine species only a single much crushed specimen was obtained. It differs from *Lyonsiella jeffreysii*, with which it agrees in the character of the hinge and ligament, in form and in wanting the fine granulation on the surface.

Lyonsiella grandis, n. sp. (Pl. XXV. figs. 3–3*b*).

Testa tenuis, inflata, valde inæquilateralis, alba, epidermide tenuissima pallide straminea plus minusve induta, liris filiformibus radiantibus crebris ornata, incrementique lineis subcancellata. Margo dorsi anticus brevissimus, posticus paulo declivis, rectus. Margo ventralis semicircularis, postice oblique in latus arcuatim ambiens. Latus anticum obliquum, in medio rectinsculum, utrinque rotundatum. Umbones magni, pileiformes, prominentes, conspicue latus versus anticum involuti. Cardo edentulus. Ligamenti sulcus interni angustissimus, brevis. Cicatrix anterior formæ elongatæ irregularis infra umbones sita, posterior major prope medium lateris. Impressiones duæ minores infra lineam cardinis collocatæ.

This species is very thin, considerably inflated, very inequilateral, higher than long, white beneath a somewhat thin pale yellowish epidermis. The valves are very finely and closely radiately lirate, and exhibit rather distinct, elevated lines of growth which almost produce a cancellated appearance.

The umbones are inflated, prominent, cap-shaped, much curved over towards the front.

having the apices rolled up remote from one another and the hinge-line, and situated quite near the anterior end. The posterior dorsal margin is rather straight, only a trifle oblique, and joins the broadly arcuate lateral outline in a well-rounded curve. The anterior portion of the upper margin is very short, forming merely a rounded angle with the obliquely truncate, almost rectilinear, anterior side. The ventral outline is semicircularly curved, and more gently ascending posteriorly than in front. The interior is white, glossy, and apparently more or less iridescent. The anterior muscular impression is elongate, of an irregular form and high up, just beneath the umbones. Behind there are three impressions, one (the largest of all) is situated about the middle of the posterior side, the two others being under the dorsal margin. The hinge-line is simple and toothless, having a thin external ligament attached to the edge along nearly the whole extent. The internal ligament is very slender, located in a very narrow groove, near, but within the edge, and probably supported by a free ossicle.

Length 14 mm., height 16, diameter 12.

Habitat.—Station 133, Mid South Atlantic, in 1900 fathoms; Globigerina ooze.

Only a single dead specimen of this fine species was obtained. It differs from *Lyonsiella papyracea*, not only in form and smaller size, but also in having much more numerous lirae.

Silenia, n. gen.

Testa tenuis, ovato-oblonga, intus margaritacea, concentrice striata, sparsim granulata; cardo edentulus; ligamentum externum, marginale. Animal ovato-oblongum, convexiusculum; pallium inferne apertum, postice siphones infra clausum. Apertura siphonalis papillis elongatis conicis scabris circumdata; sipho branchialis magnus, externe haud prominens, intus in tuba magna productus, anali contra minimo, externe paulo exstanti, intus haud prolongato; pes parvus, gracilis, sulco byssali haud aratus. Papillae orales inaequales; anticae permagnae, posticae parvae. Branchiae insignes, utrinque in serie interrupta, posticeque serie altera transversa etiam in medio interrupta digestae.

This remarkable form differs from *Lyonsiella* in possessing well-developed labial palpi, in the character and disposition of the branchiae, and one or two points with regard to the siphonal opening and the foot, &c. The shell may be distinguished from that of *Lyonsiella* by the difference in the hinge-characters, the latter genus having an internal ligament supported by a free ossicle, whilst in *Silenia* it is external and without a shelly support.

Silenia sarsii, n. sp. (Pl. XXV. figs. 4–4*b*).

Habitat.—Station 157, about 1100 miles south-west of Australia, in 1950 fathoms: Diatom ooze; also Station 325, east of the mouth of the Rio de la Plata, in 2650 fathoms: blue mud.

The soft parts of two specimens and a few fragments of the shells adhering to them were alone obtained. From these it is evident that the species is rather large, probably about 20 mm. in length. The shell is excessively thin, prettily iridescent within and faintly so on the outside, which is more or less covered with a thin filmy pale yellow epidermis, which towards the outer margin of the valves is produced into oblique thread-like lines, and somewhat reflexed within. The sculpture consists of distinct concentric lines of growth, a few subdistant hair-like radiating lines chiefly observable near the outer margin, and very minute rather irregularly scattered granules which appear to be most numerous and more regularly arranged on the anterior side. The umbones are white, smooth, incurved, and incline towards the front. The hinge-line is rounded and quite toothless in both valves. The ligament is external, strongish, and attached to the edge of the valves.

I cannot discover any sufficient reasons for separating the Australian and American specimens of this very interesting species. They agree exactly as regards the hinge, the fragility of the valves, the epidermis, and the character of the sculpture, the Atlantic example, however, exhibiting rather more distinct granulation. The animals also are precisely alike, even the number of papillæ surrounding the siphonal openings being precisely the same, namely fifteen. This is another instance of the remarkable distribution of some deep-sea forms.

Subfamily Anatininæ.

Anatina, Lamarck.

Anatina siphonata, Reeve.

Anatina siphonata, Reeve, Conch. Icon., vol. xiv. pl. i. fig. 2.

Habitat.—Station 208, Philippine Islands, at a depth of 18 fathoms; blue mud.

The Challenger specimen is a little larger than the type, and almost exactly of the same form. I think it probable that *Anatina flexuosa*, Reeve, *Anatina cumingii*, Valenciennes, *Anatina amphora*, Reeve, and one or two other so-called species, together with that under consideration, are merely variations of one and the same form.

Anatina elliptica (King and Broderip), juv.

Anatina elliptica, King and Broderip, Zool. Journ., vol. v. p. 335.
Anatina elliptica, Reeve, Conch. Icon., vol. xiv. fig. 14.
Anatina elliptica, Griffith's Anim. Kingd., vol. xii. pl. xxii. fig. 3.
Anatina prismatica, Sowerby, Proc. Zool. Soc. Lond., 1834, p. 87.

Testa juvenis fragilissima, oblonga, transversa, antice rotundata, postice lata, arcuatim truncata, inæquilateralis, alba, concentrice rugose striata, sulco obliquo haud profundo ab

umbonibus usque ad extremitatem inferiorem posticam arata, radio parum elevato umbones infra subperpendiculari interdum vix conspicuo instructa. Margo dorsi anticus obliquus, leviter arcuatus, posticus longior, horizontalis, prope umbones concavus. Ventris margo rectiusculus. Latus anticum brevis, subacute rotundatum, vix hians, posticum latum, apertissimum. Umbones parvi, acuti, ante medium siti. Cartilago interna inter callos duos minutos posita; pagina interna nitida, plus minusve prismatica, superne infra umbones porca obliqua gracili, tuberculo juncta, margine minute dentato instructa.

This shell is oblong, half as long again as high, very thin and fragile, semitransparent white, concentrically rather coarsely wrinkled and striated, exhibiting on each valve a shallow groove radiating from the umbones to the lower posterior extremity, and towards the front having (but not always) a faintly elevated ray, which falls almost perpendicularly beneath the beaks to the ventral margin. It is rather inequilateral, much gaping, broad and arcuately truncated posteriorly, narrowed and somewhat sharply curved in front, and straightish along the lower outline. The anterior dorsal slope is obliquely descending and faintly convex, the posterior being a little concave near the beaks, and then horizontal or even a trifle ascendant. The umbones are small, acute, and located rather in front of the centre. The hinge-cartilage is placed between two minute shelly processes from which diverge in an oblique direction towards the hinder extremity of each valve a slender elevated ridge, the edge of which, under the microscope, is seen to be minutely serrated or dentate. The muscular scars and mantle-impression are indistinct.

Length 12 mm., height 8, diameter 5.

Habitat.—Betsy Cove, Kerguelen Island, in 15 to 25 fathoms, January 9, 1874: and Royal Sound, Kerguelen Island, in 28 fathoms.

A specimen of this species, more than two inches in length, was collected at Cumberland Bay, Kerguelen Island, during Captain Ross' voyage, and is now in the British Museum. In the same collection are two or three others from New South Shetland, one presented by Captain P. P. King, R.N., being the type described by himself in conjunction with Mr. Broderip. In the adult shell, which is rather solid and beautifully pearly under the external calcareous surface, the internal septum loses its denticulate character.

The muscular scars are high up near the dorsal margin, both being of an elongate form. The sinus in the pallial line is very wide, and varies somewhat in depth in different specimens. The adult shells show considerable variation in the relative length of the two sides. Some specimens are almost equilateral, whilst others have the anterior portion longer than the posterior, the reverse being the case with the young individuals. The figure given by Reeve gives a rather unusual up-curving of the hinder dorsal margin,

and represents a shell somewhat higher than usual. The epidermis, judging from the slight remains on this specimen, is rather thick and fibrous.

Family SAXICAVIDÆ.

Saxicava, Fleurian de Bellevue.

Saxicava arctica, Linné.

Habitat.—Station 75, off Fayal, Azores, in 500 fathoms. Station 313, Strait of Magellan, in 55 fathoms; off Nightingale Island, Mid South Atlantic, in 100 to 150 fathoms. Stations 141 and 142, off the Cape of Good Hope, in 100 to 150 fathoms; Marion Island, in 100 fathoms; Prince Edward Island, in 150 fathoms. Station 150, south of Kerguelen, in 150 fathoms. Station 311, West Patagonia, in 245 fathoms; and lastly, at Port Jackson, Sydney, in 2 to 10 fathoms.

This polymorphous species, judging from the shells alone, is apparently distributed all over the globe. Of the animals inhabiting them we know nothing except those of northern varieties. The shells vary immensely in form, thickness, and ornamentation. Those found off the South African coast are especially remarkable for the great development of the spines on the posterior side, and have been raised to specific rank by Mr. Sowerby (Conch. Icon., vol. xx. fig. 12) under the name of *Saxicava spinifera*. Many localities have already been cited for this species, and among them may be mentioned Greenland, Norway, Great Britain, Sitka, Japan, California, Peru, Patagonia, Canaries, Madeira, Mogador, Mediterranean, Madagascar, Cape of Good Hope, Australia, New Zealand, &c.; and it is also found fossil in several Upper Tertiary formations.

Family SOLENIDÆ.

Solen, Linné.

Solen sloanii, Gray.

Solen sloanii, Gray, MS. Brit. Mus.
Solen sloanii, Hanley, Cat. Biv. Shells, 1843, pp. 12 and 336, pl. xi. fig. 18.
Solen sloanii, Angas, Proc. Zool. Soc. Lond., 1867, p. 912.
Solen sloanii, Sowerby, Conch. Icon., vol. xix. pl. iii. fig. 10.
Solen versicolor, Philippi, Abbild., vol. iii. p. 43, pl. ii. fig. 3.
Solen philippianus, Dunker, MS. in Mus. Cuming.
Solen philippianus, Sowerby, *loc. cit.*, fig. 13.

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms.

I have been unable to discover any description by Dunker of *Solen philippianus*, no mention of it being made in the Proc. Zool. Soc. Lond. for 1861 as stated by Sowerby.

Solecurtus, Blainville.

Solecurtus (*Azor*) *coarctatus* (Gmelin).

Solen coarctatus, Gmelin, Syst. Nat., p. 3227.
Solen angustior, &c., Chemnitz, Conch.-Cab., vol. vi. p. 62, pl. vi. fig. 45.
Solecurtus abbreviatus, Gould, Proc. Bost. Soc. Nat. Hist., 1861, vol. viii. p. 26; Otia, p. 164.
Solecurtus abbreviatus, Sowerby, Conch. Icon., vol. xix. figs. 6*a–b*.
Macha abbreviatus, Conrad, Amer. Journ. Conch., vol. iii., Appendix, p. 23.
Macha scheepmakeri, Dunker, Zeitsch. f. Mal., 1852, p. 56.
Azor (*Macha*) *scheepmakeri*, Dunker, Novitat. Conch., p. 121, pl. xxxix. figs. 10, 11.
Solecurtus scheepmakeri, Sowerby, *loc. cit.*, pl. iii. fig. 14.
Azor oblongus, Dunker, Proc. Zool. Soc. Lond., 1861, p. 425.
Solecurtus oblongus (Dohrn), Sowerby, *loc. cit.*, fig. 2.
Azor solidus, Dunker, Proc. Zool. Soc. Lond., 1861, p. 425.
Solecurtus solidus (*non* Gray), Sowerby, *loc. cit.*, fig. 3.

Habitat.—Station 188, south of New Guinea, in 28 fathoms; mud.

This species may be known by the depressed ray, which descends obliquely across the middle of the valves. In this respect it differs from the European *Solecurtus antiquatus*, and it is also more inequilateral. Chemnitz, in his description, remarks upon this depression, and it is strongly depicted in his figure. On this account, and also for the reason that his specimen came from the Nicobar Islands, I am inclined to agree with Jeffreys in considering this distinct from the British *Solecurtus antiquatus*. All the forms above mentioned agree in having the radiating groove, a similar epidermis, &c., and differ only slightly in form. *Solecurtus abbreviatus* was described from Chinese examples, *Solecurtus solidus*, *Solecurtus scheepmakeri*, and *Solecurtus oblongus* being quoted as Philippine forms. Sowerby (Conch. Icon., fig. 3) represents the type shell described by Dunker as *Azor solidus*, but refers the species to the *Solen solidus* of Gray. If Mr. Sowerby had read the description in the Spicilegia Zoologica, p. 7, pl. iii. fig. 12, he could not have made such an unpardonable mistake. Gray's shell has been figured by Reeve in his monograph of the genus *Psammobia*, pl. iii. fig. 18, as a manuscript species, he not being aware of its description having been published many years previously: and it is a curious coincidence that this same species was subsequently described and figured by Philippi as a *Psammobia* (Abbild., vol. i. pt. 4, p. 1, pl. i. fig. 1) under the same specific name (*solida*) employed originally by Gray.

Family Psammobiidæ.

Ervilia, Turton.

Ervilia castanea (Montagu).

Donax castanea, Montagu, Test. Brit., part ii. p. 573 ; Suppl., pl. xvii. fig. 2.
Ervilia castanea, Forbes and Hanley, Brit. Moll., vol. i. p. 311, pl. xxxi. figs. 5, 6.
Ervilia castanea, H. & A. Adams, Genera Moll., vol. iii. pl. cvi. figs. 7, 7*a*.
Amphidesma castanea, Jeffreys, Brit. Conch., vol. ii. p. 413 ; vol. v. pl. xliii. fig. 1 ; Proc. Zool. Soc. Lond., 1881, p. 922.

Habitat.—Stations 75 and 78, off the Azores, in 450 and 1000 fathoms ; also off Tenerife, in 70 fathoms.

For the distribution of this species, *vide* Jeffrey's paper in the Proc. Zool. Soc. Lond.

The West Indian *Erycina nitens*, Montagu, is very like this species, and is mainly distinguished by its rather coarser concentric sculpture and different colouring. The composition of the hinge is identical.

Ervilia biscalpta, Gould.

Ervilia biscalpta, Gould, Proc. Bost. Soc. Nat. Hist., 1861, vol. viii. p. 28 ; Otia, p. 166.
Ervilia australis, Angas, Proc. Zool. Soc. Lond., 1877, p. 175, pl. xxvi. fig. 21.
Ervilia incolor, Deshayes, MSS. in Brit. Mus.

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms (Challenger and Angas) ; off the Reefs at Honolulu, Sandwich Islands (Challenger) ; Kagosima, Japan (Gould) ; Island of Samar, Philippines (Mus. Brit.).

Australian specimens of this species appear to be rather more finely concentrically striated than those from Japan, judging from a single example in Cuming's collection from that locality. Although Gould refers only to radiating sculpture on one side, I find it occurring on both, in all specimens.

Ervilia subcancellata, n. sp. (Pl. VI. figs. 2–2*b*).

Testa subtrigona, acuminate ovata, subtenuis, parva, alba vel roseo tincta, paulo inæquilateralis, concentrice tenuiter lirata, liris ad latera attenuatis, striis tenuibus radiantibus postice decussatis. Margo dorsi posticus elongatus, fere rectilinearis leviter declivis, anticus brevior, vix excurvatus et obliquus. Umbones parvi, parum prominentes, subacuti, apicibus postice versis, paulo ante medium collocati. Cardo ut in *Ervilia castanea*.

This species is considerably longer than high, triangularly oval, not very thin, white or stained with rose, chiefly on the posterior portion. It is a little inequilateral,

moderately convex, and sculptured with fine concentric lirae, which become more slender at the sides, and are crossed chiefly on the hinder part by fine radiating striæ. The dorsal margin is angled at the beaks, and descends about equally on both sides, the posterior portion, however, being rather longer than the anterior. The ventral outline is broadly arcuate, about equally ascendant on each side, and forms, together with the dorsal slope, acutely rounded extremities at both ends. The beaks are not much elevated, small, moderately acute, and curved over at the tip towards the hinder end. The hinge consists of a central large triangular cartilage-pit in both valves, which in the right is bordered in front with an erect oblique prominent tooth fitting into a corresponding deep groove in front of the cartilage-pit in the left valve. The anterior of the valves has a short ridge or thickening, which, arising beneath the umbones, descends to the inner side of the anterior muscular impression.

Length 5 mm., height $3\frac{2}{3}$, diameter 2.

Habitat.—Station 33, off Bermuda, in 435 fathoms; coral mud. Station 113A, off Fernando Noronha, in 25 fathoms; and Station 120, off Pernambuco, in 675 fathoms.

This species is very like *Erycina niteus*, but apparently does not attain such large dimensions. It is more finely concentrically striated and prettily cancellated down the posterior side. In some instances, however, the radiating striæ extend more or less over the entire surface. There are specimens in the British Museum from St. Thomas and St. Vincent in the West Indies.

Erycina sandwichensis, n. sp. (Pl. XXV. figs. 5–5*b*).

Testa inæquilateralis, compressiuscula, ovata, alba, liris concentricis tenuibus aliisque radiantibus concinne granoso-cancellata. Margo dorsi posticus leviter declivis, rectiusculus vel levissime arcuatus, anticus longior, prope umbones peculiares tuberculiformes et rufescentes paulo concavus. Latera æqualiter subacute rotundata: margo ventris late arcuatus.

This species is pure white, with the exception of the minute tuberculiform embryonic tips of the umbones, which are of a reddish tint. It is transversely ovate, equally and rather sharply rounded at the sides, and broadly curved beneath. It is somewhat compressed and inequilateral, and sculptured with numerous slender concentric lirae, and others which radiate from the beaks, forming a very pretty cancellated surface, as the points of intersection are more or less nodulose.

The structure of the hinge is normal as in *Erycina castanea*. The interior is very glossy, and, owing to the transparency of the shell's texture, the external ornamentation is visible.

Length 3 mm., hieght 2, diameter $1\frac{1}{2}$.

Habitat—Off the Reefs at Honolulu, Sandwich Islands, in 40 fathoms.

Only a single minute valve of this species is at present known, which probably does not nearly approach the full size it attains in a more adult condition. Considering the distinct character of the sculpture, and that it is very different from all the known species, I have thought it advisable to describe this species although represented by such slight material.

Davila, Gray.

Davila (?) *umbonata*, n. sp. (Pl. VI. figs. 1–1*b*).

Testa transversim ovalis, mediocriter inæquilateralis, albida, polita, incrementi lineis concentricis irregularibus sculpta. Umbones alti, producti, ad apicem erosi. Latus anticum breve, acute rotundatum, posticum longius, latius curvatum. Margo dorsalis anterior levissime arcuatus, valde obliquus, posterior minus descendens, subrectilinearis, ventralis late arcuatus. Dentes cardinales tres in utraque valva, quorum duo ante ligamentum siti sunt. In valva dextra anterior gracilis, prope marginem locatus, in sinistra medianus minimus. Impressiones musculares irregulares, antica minore. Linea pallii postice vix sinuata. Cartilago interna magna, fusca. Ligamentum aliud lineare infra umbones situm.

The shell is thinnish, white, glossy, and striated by fine lines of growth, at intervals some of the striæ being deeper than the rest, as if marking off periods of growth. In front a large lunule is marked off by a faint line not seen by the naked eye. The form is nearly transversely oval, except that the dorsal outline is interrupted by the beaks, which are situated a little excentrically and rather nearer the anterior side. They are eroded at the tips, a trifle prominent above the hinge-line, and scarcely turned towards the front. The hinge is composed of three unequal and divergent teeth in each valve, a largish internal cartilage having two of the teeth in front and the third posterior to it, and in addition a linear ligament along the dorsal edge immediately under and on both sides of the tips of the umbones. In the right valve the foremost tooth is slender, close to and parallel with the outer edge of the valve. The second or median tooth is also slender, a trifle larger than the anterior, from which it diverges somewhat, yet having a forward direction. The hindmost, likewise narrow, inclines backwards, and is separated from the outer edge by a deepish groove. In the left valve the anterior tooth is decidedly the largest, separated from the margin with which it is subparallel by a deepish furrow. The posterior is somewhat smaller, prominent, and close to the outer edges, and the median one is very small, just under the umbo, and scarcely rises to the level of the dorsal margin. The interior of the valves is glossy and white. The muscular impressions are subequal in size and rather irregular in outline. The pallial line is rather remote from the ventral margin, and exhibits the slightest indication of a posterior sinus or emargination.

Length $6\frac{1}{3}$ mm., height nearly 5, diameter $3\frac{1}{2}$.

Habitat.—Off Royal Sound, Kerguelen Island, depth 25 fathoms; also Prince Edward Island, 150 fathoms, and Marion Island, 100 fathoms.

Variety.—This form is more compressed than the type, thinner, higher in proportion to the length, with smaller, less inflated, non-eroded beaks, and the line circumscribing the lunule is less distinct.

Length 7 mm., height $5\frac{2}{3}$, diameter 3.

Habitat.—Balfour Bay, Royal Sound, Kerguelen, in 20 to 60 fathoms.

The specimens from Prince Edward and Marion Islands, which, I believe, belong to this species, are all young, and in this state do not exhibit any trace of a lunule.

This species does not quite correspond in the hinge with the typical form of *Davila*. *Davila planæ* of Hanley having in the left valve a small, anterior, lateral tooth, which is absent in *Davila umbonata*. The very insignificant emargination of the pallial line is equally apparent in both.

Family Scrobiculariidæ.

Subfamily Semelinæ.

Semele, Schumacher.

Semele amabilis, A. Adams.

Semele amabilis, A. Adams, Proc. Zool. Soc. Lond., 1853, p. 97.
Amphidesma amabilis, Reeve, Conch. Icon., vol. viii. pl. v. fig. 32.

Habitat.—Station 189, Arafura Sea, in 25 to 29 fathoms, green mud (Challenger); Port Curtis (A. Adams).

This is a very elegant shell, and remarkable on account of the thin elevated and upturned concentric lamellæ which adorn the surface. It is somewhat longer than high, moderately compressed, almost equilateral, white and stained with brown down the posterior side of the left valve. The front dorsal slope is somewhat concave near the umbones, then oblique and straightish, the posterior being a little arched and scarcely so sloping. The ventral margin is regularly curved, and forms in front, together with the dorsal edge, a broadly rounded end. The hinder extremity is more irregular, terminating in an obtuse angle, and exhibiting more or less of an oblique truncation below the angle. The two valves are not similar at the posterior part. In the left there is a single broadish depression radiating from the beak, subparallel with and only a short distance from the hinder dorsal margin, causing a flexure in the concentric lamellæ. In the right valve there are two such depressions and a corresponding double sinuosity of the lamellæ. The lunular depression is pretty deeply lanceolate, and the hinder dorsal area is also narrow, sunken, and defined by carinate edges. The sculpture consists of the remark

able concentric lamellæ which are peculiarly curled upwards, strongly lirate, and minutely cancellated on the lower side. In addition to these lamellæ there are finer concentric liræ between, usually one in each interstice. Beside these the whole surface is densely and minutely sculptured with microscopic radiating thread-like lines, which are not so apparent as those upon the lamellæ. The hinge is composed of two minute cardinal teeth in each valve and two moderately developed laterals, whereof the posterior is rather more remote from the apex of the umbones than the anterior. The internal cartilage is long and narrow, and the external ligament, which is somewhat shorter, is slight. The interior of the valves is white, and exhibits a number of faint radiating depressions, one of them, which crosses the anterior muscular scar, and is, as it were, a continuation of the pallial line, being particularly noticeable. The pallial sinus is directed upwards, obtuse at the extremity, and reaches about half-way across the valves. The specimen obtained by the Challenger is rather larger than the type described by A. Adams, being 66 mm. long, 52 high, and 25 in diameter.

Semele obliqua (Wood), juv.

Tellina obliqua, Wood, Gen. Conch., p. 152, pl. xli. figs. 4, 5.
Amphidesma obliqua, Reeve, Conch. Icon., vol. viii. pl. i. figs. 5*a–b*.
Amphidesma variegata, Lamarck, Anim. s. Vert., ed. 2, vol. vi. p. 126.
Davila variegata, Chenu, Man. Conch., vol. ii. p. 80, fig. 346.

Habitat.—Station 122, off Pernambuco, Brazil, in 350 fathoms; red mud.

Only a single young specimen half an inch in length was obtained. It is whitish, blotched on the dorsal margin and towards the beaks with pinkish-red, and speckled in the same region with opaque white. The great depth at which this shell lived probably will account for the paleness of its colouring, which is much more vivid in all the other specimens that I have seen.

Semele infirma, n. sp. (Pl. V. figs. 1–1*b*).

Testa parva, oblique rotundato-subtrigonalis, inæquilateralis, alba, nitida, incrementi lineis sculpta, lunula distincta, lanceolata antice instructa. Umbones acuti, post medium siti, anticam partem versus inclinati. Margo dorsalis posticus valde descendens, arcuatus, anterior prope umbones concaviusculus, deinde excurvatus, ventralis late rotundatus, postice subsinuatus. Dentes cardinales duo in valva dextra, unus in valva altera. Fossæ laterales valvæ dextræ magnæ, latæ, usque ad umbonem utrinque extensæ.

The shell is minute, longer than high, thin, glossy, and sculptured with fine yet distinct lines of growth. It is of a roundish subtriangular form and inequilateral, the anterior end being the longer and regularly sharply curved, whilst the opposite side

terminates in a much more acute extremity, and indeed might be described as subrostrate. The posterior slope descends rather suddenly, and is only a little arcuate, the front margin being less oblique and more excurved, except in the lunular region, where it is slightly concave. The ventral outline is regularly and widely curved except near the hinder end, where it is feebly sinuated, which gives the subrostrate appearance to that portion of the shell. The lunule is lanceolate, narrow, and bounded by a raised ridge on each side. There is but a single cardinal tooth in the left valve, about equal in size to either of the two in the right valve, which are divergent and united at their upper extremities. The anterior does not stand separated, but is united to the ridge which forms the inner side of the lateral groove. Those on both sides commence at the beaks, extend a considerable way down the dorsal margin, and are wide and deep, receiving the prominent corresponding margins of the left valve. The internal ligament is elongate, narrow, and posterior to the cardinal teeth. The muscular scars and pallial impression are not clearly definable owing to the condition of the interior of the valves. The posterior of the former appears to be pyriform, rather large, and broader than the front one. The sinus in the mantle line is probably large.

Length $3\frac{2}{3}$ mm., height 3, diameter $1\frac{1}{2}$.

Habitat.—Flinders Passage, north of Cape York, North Australia, at a depth of 7 fathoms.

The line on each side parallel with the dorsal margin shown in fig. 1 is merely the inner edge of the hinge-plate, which is visible externally owing to the transparency of the shell.

Semele (*Abra*) *braziliensis*, n. sp. (Pl. V. figs. 2–2*b*).

Testa æquilateralis, compressa, tenuis, alba, pellucida, concentrice exiliter striata, nitida, transversim elongata, postice acuminata, antice latior, rotundata. Margo dorsalis utrinque fere rectilinearis, pone obliquior quam ante. Area elongata, planata. Umbones centrales, parvi, acuti. Lunula angusta, haud profunda. Dentes cardinales valvæ dextræ subæquales, divergentes, superne conjuncti. Fossæ laterales angustæ, postica ad umbonem haud pertingens. Ligamentum internum valde obliquum, angustum. Sinus pallii profundus, ad extremitatem subacutus.

The shell is very thin and fragile, transparent, equivalve, flattened, glossy, striated with very fine lines of growth, and sculptured with microscopical longitudinal striæ not visible under a simple lens. The form is transversely elongate, broad and rounded in front, and wedge-shaped posteriorly. The dorsal margin is peculiarly rectilinear on both sides of the beaks, a little more oblique behind than anteriorly. On the former side there is a narrow flat dorsal area reflexed almost at right angles to the rest of the

valve's surface, and consequently bounded by an acute edge extending from the umbo almost to the posterior extremity of the shell. In front there is a shallow elongate lunule, but not strongly defined. The umbones are small, acute, and just prominent above the hinge-line. The two cardinal teeth in the right valve are about equal in size, diverge from one another, being united at the upper extremities. The anterior slopes towards the front, and the posterior in the opposite direction. The lateral grooves for the reception of the side teeth in the left valve are rather remote from the apex, and the posterior one does not extend to the umbo, being interrupted by the margin which borders the internal ligament. This is narrow, elongate, and placed in a very oblique, deep pit, subparallel with the posterior slope. The adductor scars are somewhat pyriform, the hinder one being the broader. The siphonal inflection is very deep, extending some distance beyond the middle of the valve, and is rather acuminate at the anterior extremity. The interior is glossy and indistinctly radiately substriated.

Length $15\frac{1}{2}$ mm., height $9\frac{1}{3}$, diameter about 4.

Habitat.—Station 122, off Pernambuco, Brazil, at a depth of 350 fathoms; red mud.

This is a more compressed species than *Semele* (*Abra*) *philippinensis*, with straighter dorsal margins, and at once distinguished by the flat posterior area.

Semele (*Abra*) *philippinensis*, n. sp. (Pl. V. figs. 3–3*d*).

Testa tenuis, subdiaphana albida, zonis pellucidis hic illic ornata, concentrice tenuiter striata, subæquilateralis, transversim elongata, antice rotundata, postice valde acuminata, utrinque angustissime hians. Lunula angusta, lanceolata, haud profunda. Valvarum pagina interna lævigata, superne prope umbones minute corrugata. Sinus pallii latus, profundissimus. Dentes cardinales valvæ dextræ duo inæquales, sinistræ tantum unus, laterales prominentes, ab apicibus modice remoti.

This shell is transversely elongated, more than one and a half times as long as high, sharply rounded in front, and acuminate posteriorly. It is thin, somewhat gaping at each end, not very compressed, semitransparent, glossy, ornamented with alternate opaque and diaphanous concentric zones, the former being the broader, and sculptured with very fine lines of growth. The dorsal outline is subrectilinear posteriorly, and obliquely descending, in front being all but horizontal, feebly concave close to the beaks in the region of a small lanceolate lunule, and then faintly arcuate. The ventral margin is very broadly curved, and more ascending at the anterior than the opposite extremity. The umbones are small, a little post-median, but slightly elevated, and turned very slightly towards the front, and are nearly in contact. The two cardinal teeth in the right valve are unequal in size, diverging, and situated in front of the narrow and very oblique

internal ligament. The anterior is narrow, and diverges slightly towards the front, the posterior being twice as thick, triangular, and directed towards the opposite end. The lateral grooves are broad and deep for the reception of the raised corresponding teeth in the opposite valve. In this there is but a single cardinal, equalling in stoutness the large one in the right valve, and fitting in between it and the smaller one. The inner surface of the valves is glossy in the main, but towards the upper part it becomes dulled and roughened by a minute corrugation, granulation, and pitting. The muscular impressions are not clearly distinguishable, but appear to be moderately large. The siphonal inflection is very broad and deep, reaching far beyond the centre of the valves.

Length $16\frac{2}{3}$ mm., height 10, diameter 5.

Habitat.—Station 210, east of the Island of Panay, Philippine Islands, at a depth of 375 fathoms; blue mud.

Semele (*Abra*) *regularis*, n. sp. (Pl. V. figs. 4–4*b*).

Testa elongato-ovata, tenuissima, pellucida, polita, vitrea, paulo inæquilateralis, aliquanto convexa, utrinque acute rotundata, striis tenuissimis concentricis sculpta. Umbones parvi, paululum supra marginem dorsalem exerti, paulo pone medium collocati. Margo dorsi leviter convexus et declivis; ventralis late regulariterque arcuatus. Dentes laterales valvæ dextræ, elongati, lamellares, ab apice fere æquidistantes. Cardinales duo divergentes, inæquales, postico majori triangulare. Fossa ligamenti angusta, elongata, profunda. Sinus pallii profundissimus, antice late rotundatus.

Of this fragile shell only a single right valve was dredged. It is excessively thin, semitransparent, glossy, and sculptured with extremely fine lines of growth. It also exhibits towards the ventral margin a few short radiating striæ, which, however, may be merely accidental scratches. It is of an elongate ovate form, acutely rounded at both ends, rather convex, somewhat inequilateral, the anterior side being rather longer than the posterior. The dorsal margin is gently convex on both sides and moderately sloping, the ventral being broadly and regularly curved. The beaks are small, a little post-median, and slightly raised above the hinge-line. The two cardinal teeth of the right valve are of unequal size, diverging, the posterior being nearly twice the size of the front one, stout and triangular. The laterals are long, slender, prominent, about equidistant from the apex, and separated from the outer edge by a deep groove. The cartilage-pit is very long, deep, and narrow. The pallial sinus is likewise very deep, broadly rounded in front, and extends about three-fourths of the total length across the valve.

Length 7 mm., height $4\frac{3}{4}$, diameter of valve $1\frac{2}{3}$.

Habitat.—Station 185B, east of Cape York, North Australia, in 155 fathoms; coral sand.

Semele (*Abra*) *longicallus* (Scacchi).

Tellina longicallus, Scacchi, Notizie Conch. foss. di Gravina, &c., p. 16, pl. i. fig. 7.
Erycina longicallis, Philippi, Enum. Mol. Sicil., vol. ii. p. 9, pl. xiii. fig. 7.
Abra longicallis, Sars, Moll. Reg. Arct. Norv., p. 74, pl. vi. figs. 3*a*–*c*, pl. xx. fig. 4.
Syndosmya longicallis, Dall, Bull. Mus. Comp. Zoöl., Harvard College, vol. ix., No. 2, p. 133.
Scrobicularia longicallus, Jeffreys, Proc. Zool. Soc. Lond., 1881, p. 926.

Habitat.—Station 75, off the Azores, in 450 fathoms; volcanic mud.

For the distribution of this species, which occurs in many places, and at vastly different depths in the Atlantic, and also in a fossil state in Italy and Norway, reference should be made to the paper by Dr. Gwyn Jeffreys quoted above.

Semele (*Abra*) *profundorum*, n. sp. (Pl. V. figs. 5–5*b*).

Testa leviter inæquilateralis, transversim ovato, postice hians valdeque acuminata, subcompressa, tenuis, subdiaphana, alba, polita, concentrice exiliter striata, antice anguste lunulata, postice area lineare instructa. Umbones parvi, acuti, paululum pone medium siti. Margo dorsalis posticus obliquissimus, subrectus, anticus prope umbones leviter concavus, deinde vix excurvatus. Dentes cardinales duo in utraque valva, valde inæquales. Sulci laterales in dextra angusti, profundi, ab apice subremoti. Fossa pro ligamento angusta, elongata. Impressiones musculares inæquales, antica elongata, postica rotunde pyriformis. Sinus pallii latus, profundissimus. Fascies valvarum interna plerumque polita, sed in medio, umbonesque versus minutissime subgranulata.

This species is longer than high, broadly rounded in front and rather acuminate at the hinder end. The shell is inequilateral, the anterior portion being rather the longer, very thin, transparent, and moderately flat and slightly gaping posteriorly. The surface is smooth and glossy, and sculptured with fine concentric striæ or lines of growth, and in addition faint indications of very unimportant radiating sculpture are traceable. The hinder dorsal slope descends very obliquely, and is almost rectilinear. The anterior margin is much more horizontal and slightly arcuate, except close to the umbones, where a faint concavity is met with. The lunule is elongate, narrow, and defaced by a slight but distinct ridge on each side. The area is also narrow and defined by a sharpish ridge on each valve extending just beyond the lateral teeth. In addition to this there is a second but less acute angle on each valve, forming, as it were, a second larger area reaching to the posterior extremity of the shell. The beaks are small, acute, and a little elevated. The cardinal teeth are two in number in each valve. In the right the posterior is twice as large as the front one, whilst in the left it is smaller, thin, lamellar, and borders the cartilage-pit. The lateral dental grooves in the dextral valve are narrow, deep, and moderately distant from the umbo, which they do not reach on either side. The internal ligament-pit is long and narrow, and parallel

with the hinder slope. The interior of the valves is somewhat glossy towards the outer margins, whilst in the centre and subumbonal region it is minutely subgranular. It is also marked with a faint radiating substriation. The anterior muscular scar is very elongate, pyriform, and not nearly so broad as the posterior. The siphonal inflection is broad, and terminates in a sharply rounded extremity far beyond the middle of the valves. From this extremity a shallow groove extends towards the beaks, and a similar impressed ray (although insignificant) is generally observable radiating from the umbo to the inner margin of the posterior adductor scar.

Length 18 mm., height 12, diameter $5\frac{2}{3}$. A smaller specimen is $12\frac{1}{2}$ long, $8\frac{1}{2}$ high, and $3\frac{1}{2}$ in diameter.

Habitat.—Station 85, near the Canary Islands; depth, 1125 fathoms. Station 73, west of the Azores; depth, 1000 fathoms. Station 98, west of Sierra Leone, in 1750 fathoms. Station 244, Mid North Pacific, at a depth of 2900 fathoms.

Two specimens from the last locality I fail to distinguish from those from the Atlantic. They may be a little narrower and not quite so acute posteriorly, but with the exception of these trifling and possibly individual peculiarities I can discover no essential specific differences. *Abra longicallus* (Scacchi) closely resembles this species, but is a little narrower, not quite so acute at the posterior end, and has a shallower pallial sinus.

Semele (*Theora*) *iridescens* (Hinds) (Pl. V. figs. 6–6*b*).

Neaera iridescens, Hinds, Proc. Zool. Soc. Lond., 1843, p. 78.
Theora iridescens, H. and A. Adams, Gen. Rec. Moll., vol. ii. p. 370.
Theora iridescens, A. Adams, Ann. and Mag. Nat. Hist., 1864, vol. xiii. p. 209.
Theora iridescens, Tryon, Amer. Journ. Conch., vol. iv., Appendix, p. 118.

Testa tenuis, subhyalina, vitreo-alba, valde nitida, inæquilateralis, æquivalvis, utrinque anguste hians, antice lata, rotundata, postice cuneata, paulo ventricosa, incrementi lineis striata. Margo dorsi anticus primo vix arcuatus, dein oblique curvatus, posticus recte declivis. Ventris margo late arcuatus, postice leviter sinuatus. Umbones mediocriter magni, supra cardinem paulo prominentes. Dentes cardinales duo ante fossam ligamenti in valva dextra collocati, unicus in valva sinistra. Dentes laterales utrinque tenues, prominentes. Fossa cartilaginis obliqua, intus recedens. Sinus pallii magnus, profundissimus. Pagina interna radiatim et confertim striata.

Length $17\frac{1}{2}$ mm., height 11, diameter 8.

Habitat.—Amboina, in 15 to 20 fathoms (Challenger); Island of Luzon, Philippines (Hinds); Yobuka, Japan (A. Adams).

The above description is drawn up from the type specimens in the British Museum, as the single valve obtained by the Challenger is but immature. From this it will be seen that the details of the hinge do not correspond with the description given by Messrs.

Adams, who make no mention of lateral teeth. These are very thin in this species, and rather close to the beaks, especially the front one. In the right valve they are separated from the dorsal line by a narrow groove which receives the elevated marginal teeth of the opposite valve. Indeed I fail to perceive hardly any difference between the genus *Theora* and *Abra*, except that the cartilage-pit may be rather larger in most species of the former than in any forms of *Abra* with which I am acquainted. The form and texture of the shell are similar in both groups, and the pallial sinus is likewise large and deep. In the Annals and Magazine of Natural History for 1864, vol. xiii. p. 208, Mr. A. Adams again characterises *Theora*, stating that there are no primary teeth, and in describing *Theora* (*Neæra*) *fragilis* (Proc. Zool. Soc. Lond., 1855, p. 226) he observes that "there are no lateral teeth." Such assertions as these show how very superficial his examination of the species he cites must have been, for all have true cardinals as well as lateral teeth. The subgenus *Endopleura*, which he founds on the *Theora lubrica* of Gould, is not in my opinion worthy of retention. It differs only from other forms of *Theora* in possessing a radiating ridge or rib within the valves extending from the beaks obliquely towards the anterior end.

This genus (*Theora*) was formerly placed by the brothers Adams near *Neæra*, but afterwards was removed by A. Adams to the Tellinidæ, a location which is probably correct. He says "the deep sinus in the pallial line, together with the form of the valves and the pellucid vitreous texture of the shell, clearly show that this genus belongs to the Scrobiculariate division of the Tellinidæ, and not very far from the *Abra* of Leach or *Syndosmya* of Récluz."

Family TELLINIDÆ.

Subfamily PSAMMOBIINÆ.

Psammobia, Lamarck.

Psammobia[1] *costulata*, Turton.

Psammobia costulata, Turton, Conch. Ins. Brit. Dithyra, p. 87, pl. vi. fig. 8.
Psammobia costulata, Brown, Ill. Conch. Gt. Brit., pl. xxxix. fig. 34.
Psammobia costulata, Philippi, Abbild., vol. i. p. 98, pl. i. figs. 3, 4.
Psammobia costulata, Reeve, Conch. Icon., vol. x. fig. 38.
Psammobia costulata, Forbes and Hanley, Brit. Moll., vol. i. p. 279, pl. xix. fig. 5.
Psammobia costulata, Jeffreys, Brit. Conch., vol. ii. p. 394, vol. v. p. 187, pl. xlii. fig. 2.
Psammobia discors, Philippi, Enum. Moll. Sicil., vol. i. p. 23, pl. iii. fig. 8.

Habitat.—Tenerife, Canary Islands, at a depth of 70 fathoms.

This species has already been recorded from these islands. It has a wide range,

[1] The generic name *Gari* of Schumacher was published in 1817, a year previous to Lamarck's *Psammobia*; the latter, however, being generally adopted, and more in accordance with the accepted notions of zoological nomenclature, should, I think, be preferred.

having been met with in the Mediterranean, at Madeira, and off the Norwegian and British coasts.

Psammobia pulcherrima, Deshayes.

Psammobia pulcherrima, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 325.
Psammobia pulcherrima, Reeve, Conch. Icon., vol. x. fig. 46.

Habitat.—Station 172, off Nukalofa, Tongatabu, in 18 fathoms; coral mud.

The habitat of this species has hitherto been unknown. The type shell figured by Reeve is only half-grown, and on this account has been described as "thin." The single specimen obtained by the Challenger is probably adult, and at this age is rather a thick shell in comparison with many other species of this genus. It is 31 mm. long, 15 high, and $8\frac{1}{2}$ in diameter.

It is of a yellowish tinge ornamented with several slightly arcuate sanguineous rays, and tinted at the hinder extremity with pale rose. The interior is painted somewhat like the outside, except that the rays are rather more purplish and clouded. The valves are very slightly inequilateral, the anterior side being the shorter, but not so disproportioned as represented by the figure in the Conchologia Iconica. They are transversely elongate, only half as high as long, moderately convex, having the anterior two-thirds of their surface coarsely obliquely sulcate and ridged, the ridges being broader and the intervening grooves narrower than posteriorly, where they terminate abruptly at the first of the oblique radiating costæ which adorn the hinder portion of the surface. These are ten in number, gradually thicken as the shell enlarges, are separated by deep furrows, and in the early stages of growth or towards the umbones are more or less nodulose. The single tooth of the left valve and the posterior in the right are somewhat cleft at the tip, the front one in the latter valve being broad and oblique. The pallial sinus is large, deep, rounded at the end, and extends beyond the centre.

Psammobia castrensis (Spengler).

Solen castrensis, Spengler, Chemnitz, Conch. Cab., vol. xi. p. 201, pl. cxcviii. figs. 1935, 1936.
Solen castrensis, Wood, Index Test, pl. iii. fig. 25.
Psammobia castrensis, Hanley, Cat. Biv. Shells, p. 59.
Psammobia castrensis, Reeve, Conch. Icon., vol. x. fig. 32.
Psammobia oriens, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 318.
Psammobia oriens, Reeve, Conch. Icon., vol. x. fig. 1.
Psammobia oriens, Dunker, Index Moll. Mar. Japon., p. 186.

Habitat.—Station 172, off Nukalofa, Tongatabu, in 18 fathoms; coral mud.

A single specimen from this locality, dredged in a dead condition, differs from the typical form in having the posterior end of the shell more strongly sculptured than usual.

The elevated lamellæ extend about half way across the valves, and are well developed, whilst in ordinary examples they do not pass beyond the hinder umbonal ridge. The teeth, pallial sinus, and muscular impressions are similar, and the painting, which is of a bright pink-scarlet colour, has a like disposition.

Psammobia oriens I consider the adult form of this species, and at this age (being much thicker) the external camp-like markings are concealed within by a shelly deposit.

The specimen figured by Chemnitz is a young shell, and said to have come from the coast of Guinea. Should this be true, my association of *Psammobia oriens* with this species would probably be incorrect. However, I believe this identification to be accurate, for the shell figured by Reeve from the Philippine Islands and another in the British Museum from Hainan correspond very closely with the description and figure of Chemnitz. *Psammobia oriens* was described from Japanese specimens, and in the Cumingian collection there are others from Torres Strait.

Psammobia sp.

Habitat.—Off Amboina, in 15 to 20 fathoms.

A single, apparently young, valve is all that was dredged. It very closely resembles *Psammobia weinkauffi*, Crosse, from the Algerian coast, judging from the description and figure in the Journal de Conchyliologie, 1864, vol. xii. p. 17, pl. ii. fig. 4, and, had I not known that it came from so distant a locality as Amboina, I should not have hesitated to have identified it with that species. The oblique striæ may possibly prove on comparison a trifle coarser, and probably other characters will be observable which will separate the two forms.

Psammobia lineolata, Gray.

Psammobia lineolata, Gray, Dieffenbach's New Zealand, vol. ii. p. 253.
Psammobia lineolata, Hanley, Cat. Biv. Shells, p. 59, Appendix, p. 346, pl. xiv. fig. 1.
Psammobia lineolata, Reeve, Conch. Icon., vol. x. fig. 58.
Psammobia lineolata, Hutton, Manual N. Zeal. Moll., p. 142.
Psammobia lineolata, Smith, Voy. "Erebus" and "Terror," pl. ii. fig. 11.
Psammobia concava, Reeve, Conch. Icon., vol. x. fig. 59, *a*, *b*.

Habitat.—Station 167A, Queen Charlotte Sound, near Long Island, New Zealand, in 10 fathoms; mud.

This species, according to Hutton, is common, and ranges from Auckland to Dunedin and the Chatham Islands. It is elongate, suboval, rather narrower anteriorly than behind, almost equilateral, glossy, sculptured with fine concentric lines of growth, pinkish, sometimes reddish-pink, varied with paler and darker concentric zones, and very minute anastomosing subradiate, more or less pellucid, lines. At times specimens are met with

which are faintly rayed. The valves are compressed, especially in young shells, and gape at both ends. The anterior dorsal margin is moderately oblique, very slightly convex, the posterior being rather more horizontal and generally a little concave. The anterior side, which is a trifle shorter than the posterior, is rounded at the extremity, the hinder side terminating more sharply at a point rather low down, where a feeble ridge radiating from the umbones terminates. The ventral outline is widely arcuate, and ascends a little higher in front than behind. The two teeth of the right valve are both bifid, erect, and divergent from one another. The left valve also has two teeth, one erect, cleft at the top, similar to those in the right valve, the other being less conspicuous, oblique, thin, lamellar, almost obsolete in some specimens, and situated behind the more prominent tooth which falls just beneath the umbo. The muscular scars are large, about equal in size, the anterior being usually of a more elongate form. A third smaller deepish scar is situated beneath the hinge-line, a little in advance of the teeth. The pallial sinus is in every case deep, although not always equally so, and is irregular at times in form.

Psammobia convexa, Reeve, is undoubtedly the same species as the present. The two specimens figured in the Conchologia Iconica are rather thick old shells, and a trifle more convex than usual, but answer the above description in every other detail.

The Tasmanian *Psammobia zonalis*, Lamarck, is very closely allied, and perhaps scarcely worthy specific separation, but may be distinguished thus. It is somewhat smaller, not usually quite so glossy, more strongly striate, especially at the posterior end and near the ventral edges, and generally of a less pinkish tinge. With *Psammobia zonalis* I have no hesitation in uniting *Psammobia tellinaformis*, Deshayes, *Psammobia puella*, Deshayes, and *Psammobia striata*, Deshayes, the last being, I believe, a manuscript name attached to specimens in the British Museum, from between West Hill and Cape Upstart, Australia, collected by J. B. Jukes, Esq.

Psammobia pallida, Deshayes.

Psammobia pallida, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 323.
Psammobia malaccana, Reeve, Conch. Icon., vol. x. fig. 42.
Psammobia suffusa, Reeve, *loc. cit.*, fig. 54.

Habitat.—Station 188, west of Cape York, North Australia, in 28 fathoms; green mud (Challenger); Red Sea (type in Brit. Mus.); Malacca (Reeve for *Psammobia malaccana* and *Psammobia suffusa*); Lane Cove River, New South Wales (Brit. Mus.).

There is no difference whatever excepting that of colour between *Psammobia pallida* and *Psammobia malaccana*, the former being of a pale lilac tint, faintly rayed with a darker hue, and the latter being purely white. *Psammobia suffusa* I regard merely as the young state of a more highly coloured variety. The sculpture of all three is precisely similar, the oblique striæ terminating abruptly in an oblique line easily recognisable to

the naked eye, as the portion of the surface behind the line is far less glossy than the remainder. The dentition of all is the same, consisting of two cardinal teeth in each valve, all bifid, with the exception of the posterior in the left, which is smaller than the others and oblique. In addition to these, there is in each valve a more or less distinct lateral tooth rather remote from the cardinals. The type of this species is in the British Museum, with the locality "Red Sea" attached to it, but I am unable to discover upon what authority it is so labelled. No mention is made of *Psammobia pallida* by Reeve, whose monograph, with two exceptions, is based upon the specimens contained in Mr. Cuming's collection. The fact of this shell having lateral teeth should remove it from this genus. However, the "tout ensemble" is so *Psammobia*-like (and I find other forms intermediate with respect to this character) that I think it may properly be allowed to remain with this group.

Psammobia intermedia, Deshayes.

Psammobia intermedia, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 319.
Psammobia intermedia, Reeve, Conch. Icon., vol. x. fig. 25.
Gari intermedia, Tryon, Cat. Tellinidæ in Amer. Journ. Conch., vol. iv., Appendix. p. 74.

Habitat.—St. Vincent, Cape de Verde Islands, in 7 to 20 fathoms (Challenger); coast of Portugal (Deshayes).

The Challenger specimens of this species are only about half the length of the shell figured by Reeve, and more brightly variegated with a rosy purple tint, the interior exhibiting the markings more vividly than the exterior.

Psammobia zonalis (Lamarck).

Psammotæa zonalis, Lamarck, Anim. Sans Vert., ed. 2, vol. vi. p. 182.
Psammotæa zonalis, Delessert, Recueil, pl. v. fig. 9, *a–c*.
Psammotæa zonalis, Hanley, Cat. Rec. Biv. Shells, p. 60, and Appendix, p. 346, pl. xi. fig. 50.
Psammobia zonalis, Reeve, Conch. Icon., vol. x. fig. 29.
Psammobia tellinæformis (Deshayes) Reeve, *loc. cit.*, fig. 31.
Psammobia puella, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 320.
Psammobia puella, Reeve, Conch. Icon., fig. 2.
Psammobia striata, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 321.
Psammobia compta, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 321.
Psammobia compta, Reeve, *loc. cit.*, fig. 24.
Psammobia radiata, Dunker, in Philippi's Abbildungen, vol. i. p. 194, pl. ii. fig. 5.

Habitat.—Port Jackson, Sydney, in 4 to 18 fathoms.

This species has also been found at Amboina, Java, Philippine Islands, and Tasmania. It varies somewhat in painting, some forms being more rayed than others. In all, however, the apices of the umbones are pale, and the interior of the valves more or less lilac.

Psammobia anomala, Deshayes.

Psammobia anomala, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 320.
Psammobia anomala, Reeve, Conch. Icon., vol. x. fig. 5.
Var. = *Psammobia tenuis*, Reeve (*non* Deshayes), *loc. cit.*, fig. 37*a*.

Habitat.—Cape York, North Australia, in 3 to 12 fathoms (Challenger); Philippine Islands, Zebu (Deshayes); Brisbane Water, east coast of New Holland (Reeve); Torres Strait (Coll. Cuming).

The single specimen from Cape York is coloured precisely like the typical shell figured by Reeve, and that from Torres Strait in the Cumingian collection is similarly painted. In this form the oblique posterior ridge is more strongly marked than in the variety figured by Reeve as *Psammobia tenuis*. The latter species may be known from *Psammobia anomala*, by the total absence of lateral teeth on the posterior side, the presence of which in this species approximates it to *Psammobia pallida*. It is, however, narrower and more finely sculptured than that form.

Psammobia modesta, Deshayes.

Psammobia modesta, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 319.
Psammobia modesta, Reeve, Conch. Icon., vol. x. fig. 3.
Psammobia menkeana, Reeve, *loc. cit.*, fig. 43.
Psammobia angusta, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 320.
Psammobia angusta, Reeve, Conch. Icon., fig. 41 (bad).

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms.

This species also ranges further north to Moreton Bay, if that locality, the first assigned to it, can be relied upon.

The typical form externally is of a bluish-white colour, ornamented with a few purple-red rays, chiefly developed near the ventral outline, and more or less pinkish-violet within. A single valve obtained by the Challenger and a specimen in the British Museum collected during the voyage of the "Rattlesnake" are of an orange-red tint within and without, being paler towards the margins and at the apex of the umbones. Other specimens, also from Port Jackson, I have seen which are totally white. The concentric striation of this species is fine, being most conspicuous at the anterior end.

Tellina menkeana, Reeve, is identical with this species, although, judging from the two figures in the Conchologia Iconica, the one appears to be a much more slender shell than the other. This arises from two causes. In the first place the shell depicted in fig. 3 is not so broad in reality as the drawing, and that represented in fig. 43 has the ventral margin of the valves broken away somewhat, so that the form appears more elongate than it would if the specimen were perfect. I also fail to discover any character in *Tellina angusta* which will separate it from this species. The locality

assigned to it, namely Senegal, I regard merely as one of the numerous errors of this description occurring in the collection of Mr. Cuming.

Subfamily Tellininæ.

Tellina, Linné.

Tellina (*Macoma*) *consociata*, n. sp. (Pl. IV. figs. 4–4*b*).

Testa paulo inæquilateralis, ovato-trigonalis, alba, epidermide caduca lutescenti induta, postice parum hians, dextrorsum subflexuosa, valva dextra quam sinistra aliquanto planiore, parte antica subelongata, ad finem mediocriter acute rotundata, postica multo breviore, cuneiformi, ad extremitatem oblique truncata ; valvæ tenues, submitentes, incrementi lineis tenuibus striatæ. Margo dorsi anticus declivis, subrectilinearis, elongatus, posticus magis obliquus, rectus, brevior, margo ventralis late arcuatus, antice regulariter adscendens, postice vix flexuosus. Dentes cardinales valvæ dextræ duo, posteriori bifido, in sinistra unicus pariter bifidus. Pallii sinus magnus, spatium subquadrangulare includens. Pagina interna alba, radiatim substriata.

This shell is moderately thin, somewhat inequilateral and inequivalve, the right being slightly less convex than the left. It is longer than high, triangularly ovate, sharply rounded in front, wedge-shaped, and shortly truncated behind, very slightly gaping at the posterior end, which is bent a little to the right. It is of a pure white colour, more or less concealed by a clay-coloured caducous epidermis which is a little reflexed within the margin of the valves. The sculpture consists of fine concentric lines of growth and traces of radiating substriæ. The umbones are small, acute, and located somewhat behind the central point. The front dorsal margin is long, only slightly oblique, almost straight or very feebly excurved, the posterior being rather shorter, rectilinear, and very sloping. The ventral outline is gently curved, a little more ascendant in front than behind, where there is only the faintest indication of a sinus. Both valves are shallowly grooved down the posterior side, the left rather more distinctly than the right. The hinge consists of two cardinal teeth in the right valve and one in the left, the posterior in the former and that in the latter being cleft at the summit. The interior of the valves is white, and marked with faint radiating substriæ. The pallial sinus is large, and extends considerably beyond the centre, the circumscribing line forming a somewhat quadrangular figure.

Length 22 mm., height 15½, diameter 8.

Habitat.—South of Amboina, at a depth of 15 to 25 fathoms.

This species closely resembles the shell figured by Hanley (Thesaurus, fig. 13) as the *Tellina umbonella* of Lamarck. The locality, "Port Lincoln," which he assigns to it is probably taken from a specimen in the British Museum said to have come from that place. In the Proceedings of the Zoological Society, 1871, p. 727, I quoted this species from

Whydah on the west coast of Africa. I am inclined to consider the former "habitat" incorrect, for there is little likelihood of West Africa and South Australia producing the same species. There is no doubt regarding the correctness of the locality Whydah, for the specimens of this species referred to were dredged by Captain Knocker together with a number of others, all of which are West African types.

The present species has a more triangular appearance, is a little narrower, rather more acuminate at both ends, and lacks the broad reddish ray near the umbones. The posterior dorsal slope is longer and a trifle more oblique, so that the apical angle is also somewhat more acute.

Tellina (*Macoma*) *uruguayensis*, n. sp. (Pl. IV. figs. 5–5*b*).

Testa tenuis, inæquilateralis, transversim elongata, utrinque hians, postice angustata, subrostrata, dextrorsum conspicue flexa, antice rotundata, parum inæquivalvis, alba, epidermide lutescenti prope marginem induta, striis incrementi tenuibus insculpta. Margo dorsi anticus elongatus, vix descendens, leviter arcuatus, posticus brevior, prope umbones paulo concavus dein, rectus, valde declivis. Ventris margo lente curvatus, postice in valva sinistra levissime sinuosus. Dentes cardinales valvæ dextræ duo, parvi, in valva sinistra unicus. Pallii sinus profundus, ad finem rotundatus. Pagina interna alba, aliquanto iridescens, radiatim substriata.

This species is very much longer than high, thin, white, finely striated by lines of growth, and more or less covered near the ventral margin by a dirty yellowish epidermis. It is considerably inequilateral, the anterior side being the larger, rounded at the extremity, and scarcely narrowing; the hinder portion, on the contrary, is considerably attenuated or subrostrate, and narrowly truncated at the extremity. The valves are a little unequal, the left being rather more convex than the other. Both are turned conspicuously to the right at the hinder end, and gape somewhat on both sides. The front dorsal outline is faintly arcuate and only a very little oblique. The posterior, which is shorter, being much more sloping, at first, close to the beaks a little concave and then almost rectilinear. The lower margin is but very slightly arched near the middle, rises in a gentle curve anteriorly, and behind exhibits in the right valve a very faint trace of an incurvation or sinus. The ligament is sordid yellow, short and prominent. The hinge is composed of two small prominent teeth in the right valve and a single one in the left. The inner surface of the valves is white, somewhat iridescent and radiately substriated. The anterior muscular scar is elongate and irregular in outline, the posterior is shorter and broader. The siphonal inflection is very deep, narrow, rounded at the extremity, the line which encloses it returning about half way across the valves before joining the other part of the pallial line, parallel with the ventral margin.

Length 22 mm., height 12½, diameter 6.

Habitat.—Station 321, off Monte Video, Uruguay, in 13 fathoms; mud.

This species ranges further north as far as the West Indies. Specimens from the Island of St. Thomas in the British Museum are perhaps a trifle longer in proportion to their height than the examples from Monte Video. The largest of the Caribbean shells is 29 mm. long, 16 high, and 8 in diameter.

Tellina (*Macoma*) *arafurensis*, n. sp. (Pl. IV. figs. 6–6*b*).

Testa transversim oblonga, antice rotundata, postice angustata, truncata, modice convexa, valde inæquilateralis, alba, paulo iridescens, epidermide tenui flavo-grisea partim induta, lineis incrementi concentricis, striisque tenuissimis radiantibus insculpta. Valvæ postice prope marginem dorsalem sulco inconspicuo decurrente signatæ, aliquantoque hiantæ. Margo dorsi anticus elongatus, parum obliquus, leviter arcuatus, posticus valde declivis, rectilinearis. Ventris margo antice arcuatus, latus posticum versus inconspicue subsinuatus vel incurvatus. Area lanceolata, profunda, marginibus subacutis inclusa. Dentes cardinales parvi, in valva dextra duo, posticus valde fissus, in sinistra unicus, erectus. Pallii sinus magnus, subquadratus, fere ut in *Tellina truncata*, Jonas.

Length 47 mm., height 30, diameter 14.

Habitat.—Station 190, Arafura Sea, in 49 fathoms; green mud.

This species is somewhat intermediate in its characters between *Tellina galatæa*, Lamarck, and *Tellina truncata*, Jonas. It is not quite so elongate as the former, but rather more prolonged than the latter. It differs from *Tellina galatæa* also in sculpture, being less coarsely radiately striated, not granular, lacking the peculiarly sculptured rays, and it is also faintly iridescent. The posterior side of *Tellina arafurensis* ends in a narrower truncation, and the dorsal slope is rather more abruptly descending, yet not so suddenly oblique as in *Tellina truncata*. The latter is decidedly higher, and the hinder dorsal margin or ligamental slope being more abruptly oblique, the apical or umbonal angle is more acute than in the present species. *Tellina gubernaculum*, Hanley, said to have been found on the west coast of Central America, is also very closely allied to the species under consideration. It has a broader truncated end posteriorly, and a shorter ligamental margin than *Tellina arafurensis*.

Tellina murrayi, n. sp. (Pl. III. figs. 8–8*b*).

Testa transversa, elongata, tenuis, paulo inæquilateralis, albida, versus umbones pallide flavescens, semipellucida, liris tenuibus concentricis aliisque confertioribus radiantibus minus conspicuis concinne ornata. Margo dorsi utrinque leviter æqualiterque declivis, antice vix convexus, postice primo paulo concavus. Margo ventralis late curvatus, latum posticum subrostratum versus subsinuatus, antice adscendens, rotundatim in

dorsalem ambiens. Umbones parvi, acuti, subprominentes. Cardo normalis, dente postico valvæ dextræ, antico in sinistra triangulari bifido, lateralibus fere æquidistantibus.

This shell is transversely elongated, sharply rounded in front, narrowed and somewhat rostrate at the opposite end. It is slightly inequilateral, the anterior side being a little the longer. It is thin, semipellucid, whitish or tinted with pale yellow at the upper part, and ornamented with fine concentric liræ which are more numerous upon the anterior half of the valves than behind. Besides these there are others more closely packed and scarcely visible to the naked eye which radiate from the small acute prominent umbones and produce upon the concentric ones a somewhat crenulate appearance. The dorsal margin is about equally sloping on both sides, straight or the slightest convex anteriorly, and feebly concave at first behind the umbones. The lower outline is broadly arcuate at the middle and in front, but slightly incurved posteriorly. The dentition of the hinge is the same as in the typical section of the genus, and the pallial sinus is deep and rounded at the end.

Length 8 mm., height 4½, diameter 2.

Habitat.—Station 185B, off Cape York, North Australia, in 155 fathoms; coral sand.

The specimens here described are possibly young shells, but the peculiarity of the sculpture will readily distinguish the species.

Tellina compacta, n. sp. (Pl. III. figs. 9–9*c*).

Testa elongata, subdonaciformis, valde inæquilateralis, antice rotundata, postice angustata, subcuneiformis, mediocriter convexa, alba, interdum dilutissime rosea, zonis angustis paucis pellucidis ornata, incrementi lineis fortiter striata. Margo dorsi anticus perelongatus, parum declivis, subrectilinearis, posticus valde obliquus, rectus, brevis. Margo ventris leviter arcuatus, anterius rotundatim, posterius parum adscendens. Umbones parvi, acuti, circiter in ¼ longitudinis collocati. Dentes cardinales duo lateralisque unicus in utraque valva; ligamentum breve, flavo-fuscum, prominens. Pagina interna nitens, paulo iridescens, pallii sinu magno profundo notata.

The form of this species recalls that of certain varieties of the genus *Donax*. It is not quite twice as long as high, rounded and only slightly narrowing anteriorly, much shorter behind, narrowed and somewhat wedge-shaped. It is very inequilateral, the anterior side constituting by far the larger portion of the shell. It is moderately strong and thick, a little convex, slightly gaping at both ends, whitish, or with a blush of pink, varied at intervals with narrow bluish somewhat pellucid zones, and sculptured with fine concentric lines of growth, which, however, are rather coarser near the ventral edge. The front dorsal margin is almost twice as long as the posterior, almost horizontal and

straight. The hinder slope is very oblique and also straightish. The ventral outline is but slightly excurved, not sinuated posteriorly, regularly up-curved in front, forming with the dorsal margin an obtuse rounded extremity. At the opposite end it is less ascending and forms a blunt angle at its junction with the lateral outline. The hinge is composed of two cardinal teeth and a single anterior lateral in each valve. Of the former the posterior in the right valve, and anterior in the left, are triangular, bifid, and much larger than the others, and the lateral tooth of the right valve is more conspicuous than that of the left, which consists merely of a slight prominence of the dorsal edge. The ligament is shortish, yellow-brown, and prominent. The inner surface of the valves is glossy, somewhat iridescent, and exhibits a deep large pallial sinus extending almost to the anterior scar.

Length 19½ mm., height 11, diameter 5½.

Habitat.—Station 187, off Cape York, North Australia, in 6 fathoms; coral mud.

This species is considerably like the European *Tellina donacina*, Linné, as regards form, but rather more tapering at the anterior end, somewhat shorter and scarcely so acuminate posteriorly, and the sculpture is a little coarser.

Tellina (*Tellinella*) *verrucosa*, Hanley.

Tellina verrucosa, Hanley, in Sowerby's Thesaurus, vol. i. p. 225, pl. lviii. fig. 77.
Tellina verrucosa, Sowerby, Conch. Icon., vol. xvii. fig. 96.
Tellina (*Tellinella*) *verrucosa*, Römer, Conch.-Cab., ed. 2, p. 23, pl. ix. figs. 1–3.

Habitat.—Station 172, off Nukalofa, Tongatabu, in 18 fathoms (Challenger); Bay of Manila, Philippine Islands (Cuming).

This species is narrower and more rostrate than *Tellina asperrima*, Hanley, *Tellina pulcherrima*, Sowerby, *Tellina semiaspera*, Deshayes, and *Tellina squamulosa*, which have more or less similar style of sculpture.

Tellina (*Tellinella*) *charlottæ*, n. sp. (Pl. IV. figs. 1–1*b*).

Testa tenuis, albida, umbones versus lutescens, valde inæquilateralis, elongata, antice rotundata, postice acuminata, ad extremitatem breviter truncata, concentrice tenuiter lirata, liris postice hic illic anguste lamellatis. Margo dorsi anticus parum obliquus, vix curvatus, posticus brevior, valde declivis, rectilinearis. Margo ventris leviter arcuatus, postice vix sinuatus. Dentes cardinales valvæ dextræ duo divergentes, unicus in valva sinistra subbifidus. Laterales tenues fere æquidistantes. Sinus pallii profundissimus fere ad cicatricem anteriorem extensus.

This species is entirely white with the exception of a very faint tinge of yellow towards the beaks. It is thin, compressed, very inequilateral, the anterior side being considerably longer than the posterior. It is transversely elongated, sharply rounded in front, and

shortly wedge-shaped behind, terminating in a short truncation. The surface is not highly glossy, but has a silky, faintly iridescent, appearance. The sculpture consists of numerous concentric thread-like liræ which become gradually thicker as the shell increases. They do not all extend quite to the hinder margin, but stop short at a slight fold radiating from the beaks to the lower hindmost extremity. Some of them, however, do reach the margin, and these are elevated into short lamellæ, those on the right valve being a little flexuous. The front dorsal slope is the slightest excurved, and descends only a little. The posterior is shorter, very straight and very oblique. The lower outline is slightly arcuate, and very feebly sinuated posteriorly. The interior is glossy, radiately substriated, and exhibits a pale yellow stain towards the umbones. There are two cardinal teeth in the right valve and one in the left, that in the latter, and the posterior in the former, being somewhat cleft at the top. The lateral teeth are slender, elongate, the anterior being rather nearer the beaks than the posterior. The pallial sinus is large and deep, extending almost to the front muscular impression.

Length 14 mm., height 8½, diameter 3½.

Habitat.—Station 167A, Queen Charlotte Sound, Cook Strait, New Zealand, in 10 fathoms; mud.

Tellina (*Tellinella*) *huttoni*, n. sp. (Pl. IV. figs. 2–2*b*).

Testa tenuis, compressa, valde inæquilateralis, oblonga, antice rotundata, postice acuminata, nitida, concentrice tenuiter striata, dilute rosacea. Margo dorsi anticus elongatus, vix declivis, pene rectilinearis, posticus brevior, obliquissimus, rectiusculus. Margo ventris parum arcuatus, antice curvatim ascendens, postice haud sinuatus. Umbones acuti, albi, in ⅓ longitudinis locati. Dentes cardinales duo in utraque valva, postico valvæ dextræ et antico sinistræ crassioribus, triangularibus. Dentes laterales in valva dextra distincti, anteriori cardinalibus approximato, posteriori remoto. Sinus pallii profundissimus, fere ad cicatricem anteriorem productus.

This species is very closely related to *Tellina glabrella*, Deshayes, also from New Zealand, and indeed it is with some degree of hesitation that I venture to separate it. It is a trifle more inequilateral, of a pinkish colour, has the anterior dorsal line longer and less sloping, the beaks rather less prominent, and the anterior lateral tooth rather more approximated to the cardinals than is the case in *Tellina glabrella*.

Length 10 mm., height 5⅔, diameter 2.

Habitat.—Station 167A, Queen Charlotte Sound, Cook Strait, New Zealand, in 10 fathoms; mud.

Only a single specimen of this species was brought home, which possibly is not of the full size it sometimes attains. It is a small pinkish shell, having the right valve a trifle flatter than the left. It is thin, wedge-shaped behind, broad and rounded in front.

Tellina (*Angulus*) *raltonis*, Hanley.

Tellina raltonis, Hanley, Proc. Zool. Soc. Lond., 1844, p. 143.
Tellina raltonis, Hanley, in Sowerby's Thesaurus, vol. i. p. 283, pl. lvii. fig. 68.
Tellina raltonis, Sowerby, Conch. Icon., vol. xvii. fig. 82 (narrow var.).
Tellina (*Angulus*) *raltonis*, Römer, Monogr. Conch.-Cab., ed. 2, p. 159.

Habitat.—Levuka, Fiji Islands, in shallow water.

The locality of this species has not previously been recorded. The pallial sinus is very large, reaching almost to the anterior scar. The line circumscribing it at first rises some distance from the lower end of the hinder cicatrix, then descends obliquely and more or less rectilinearly below the front scar, and finally falls subperpendicularly into the pallial line beneath. The single specimen in the national collection is of a very pale pink tint, whilst that obtained by the Challenger is very much deeper in tone, but the pale rays at the posterior end are more conspicuous in the former than the latter.

Tellina vernalis of Hanley is closely allied to this species, being similarly sculptured and very like in colour, except that the posterior pale rays are wanting. It is, however, broader at the anterior end, and less acuminate behind. The hinge and pallial sinus are the same.

Tellina (*Angulus*) *lux*, Hanley, var.

Tellina lux, Hanley, Proc. Zool. Soc. Lond., 1844, p. 140.
Tellina lux, Hanley, Sowerby's Thesaurus, vol. i. p. 288, pl. lvii. fig. 71.
Tellina lux, Sowerby, Conch. Icon., vol. xvii. fig. 286.
Tellina (*Angulus*) *lux*, H. and A. Adams, Genera Rec. Moll., vol. ii. p. 397.
Tellina (*Angulus*) *lux*, Römer, Conch.-Cab., ed. 2, p. 159.

Habitat.—Station 189, Arafura Sea, in 25 to 29 fathoms, and Torres Strait, in 8 to 11 fathoms (Challenger); Philippine Islands (Cuming).

The shells from the first two localities are not quite identical in form or colour with that figured by Hanley, but still, I have no doubt, belong to this species. The front dorsal slope is not quite so oblique, the posterior scarcely so concave, and the hinder side-margin is rather more arcuate. They are of a pinkish-white tint, with a pale pink ray posteriorly. *Tellina raltonis* is very closely related to this species, having the same hinge-dentition and pallial sinus, and distinguished principally by a slight difference of form at the hinder extremity.

Tellina (*Angulus*) *natalensis*, Krauss.

Tellina natalensis, Krauss, Südafr. Moll., p. 3.
Tellina natalensis, Philippi, Abbild., vol. ii. p. 91, pl. iv. fig. 4.
Tellina natalensis, Sowerby, Conch. Icon., vol. xvii. fig. 280, *a*, *b*.
Tellina natalensis, Römer, Monogr. Conch.-Cab., ed. 2, p. 161.

Habitat.—Simon's Bay, Cape of Good Hope, in 15 to 20 fathoms

There are also specimens of this species in the British Museum from the above locality dredged during the voyage of the "Rattlesnake" in 7 fathoms on a sandy bottom. The Challenger specimens are concentrically zoned with pink and cream colour, intermingled here and there with narrow diaphanous stripes, and again others are destitute of the pink bands. On the other hand, the "Rattlesnake" examples are pinkish-red, in some instances paler than others, or totally white, and at times varied with a few pale rays, like the typical form described by Krauss.

Tellina (*Angulus*) *vernalis*, Hanley.

Tellina vernalis, Hanley, Proc. Zool. Soc. Lond., 1844, p. 141.
Tellina vernalis, Hanley, in Sowerby's Thesaurus Conch., vol. i. p. 289, pl. lviii. fig. 81.
Tellina vernalis, Sowerby, Conch. Icon., vol. xvii. fig. 284.
Tellina (*Angulus*) *vernalis*, Römer, Conch.-Cab., ed. 2, Monogr. Tellina, p. 159.
Tellina (*Angulus*) *vernalis*, H. and A. Adams, Genera Moll., vol. ii. p. 397.

Habitat.—Amboina, in 15 to 20 fathoms (Challenger); Singapore (Hanley).

This species is not quite so flattened as *Tellina lux*, rather more oblong, and has a shorter and less concave ligamental slope. It is perhaps also a trifle thinner, but has a similar hinge, and the muscular scars and pallial sinus are very nearly alike in both species. *Tellina unifasciata*, Sowerby, is also closely allied to the two species under comparison, but is narrower and more acuminate behind than either.

Tellina (*Angulus?*) *rhomboides*, Quoy and Gaimard.

Tellina rhomboides, Quoy and Gaimard, Voy. "Astrolabe" Zool., vol. iii. p. 502, pl. lxxxi. figs. 4–7.
Tellina rhomboides, Hanley, in Sowerby's Thesaurus, vol. i. p. 304, pl. lviii. figs. 92, 96, 97.
Tellina rhomboides, Sowerby, Conch. Icon., vol. xvii. fig. 114, *a*, *b*.
Tellina (*Angulus*) *rhomboides*, Römer, in Conch.-Cab., ed. 2, p. 144, pl. xxxi. figs. 14–17 (magnified).
Tellina clathrata (Quoy), Deshayes, Hist. Anim. sans Vert., ed. 2, vol. vi. p. 208.
Tellina clathrata, Hanley, Cat. Rec. Biv. Shells, p. 65; Suppl. pl. xiv. fig. 12.
Tellina (*Peronella*) *para*, H. Adams, Proc. Zool. Soc. Lond., 1870, p. 789, pl. xlviii. fig. 6.
Tellina texturata, Sowerby, Conch. Icon., vol. xvii. pl. xli. fig. 233, pl. xlv. fig. 233*b*.
Tellina lauta, Gould, Wilkes' Explor. Exped., vol. xii. p. 408; Atlas, figs. 514–514*b*; Otia Conch., p. 79.
Tellina compta, Gould, *loc. cit.*, p. 406, figs. 575–575*b*; Otia Conch., p. 79.
Tellina silicula (Deshayes), Sowerby, Conch. Icon., vol. xvii. fig. 278, *c*, *d*.
Tellina bifaria, Baird, in Brenchley's Cruise of the "Curaçoa," p. 451, pl. xli. fig. 13.
Tellina caseus, Sowerby, Conch. Icon., vol. xvii. fig. 115.

Habitat.—Cape York, North Australia, in 3 to 12 fathoms, and Levuka, Fiji Islands, in 12 fathoms.

This species is variable somewhat as regards form and the fineness of the oblique striæ, but quite constant in the character of the hinge. This consists of two strongish cardinal teeth in the right valve, the anterior being cleft at the top, and a single bifid one

in the left, with generally, especially in young shells, a second very small oblique slender one posterior to the other. The ligament-plates (nymphæ) are moderately developed and more or less obliquely roughly striate, and somewhat grooved lengthways. From this desciption it will be seen that the hinge of this species coincides exactly with that of *Psammobia*. The pallial sinus is very deep, reaching almost to the anterior scar. *Tellina siliculu*, Deshayes, and *Tellina compta*, Gould, are absolutely identical in every respect, and are more closely and more obliquely striated than some other forms of the species. *Tellina pura*, H. Adams, and *Tellina bifaria*, Baird, agree with one another in colour, lacking the rosy rays of the two above mentioned varieties.

The distribution of this pretty shell is as extended as its colour is variable. It has already been recorded from the Philippine and Mariana Islands, New Caledonia, and the Gulf of Suez, and in the British Museum there are specimens from the Keeling and Fiji Islands, and also Madagascar.

Tellina (*Arcopagia*) *pretiosa*, Deshayes.

Tellina pretiosa, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 360.
Tellina pretiosa, Sowerby, Conch. Icon., vol. xvii. fig. 329.
Tellina costata, Sowerby, *loc. cit.*, fig. 194.

Habitat.—Levuka, Fiji Islands, in shallow water (Challenger); Island of Ovalau, Fiji, in 12 fathoms, sandy bottom (Brit. Mus.); Philippine Islands.

There is no likelihood of this charming species being confounded with any other. It is well distinguished from all others by the beautifully squamate costellæ which adorn the surface. These are somewhat variable in number and thickness, those (about forty) in the type from the Philippine Islands being a little stouter and less numerous than those of Fiji examples, the latter, in this respect, agreeing perfectly with the shell figured by Sowerby as *Tellina costata*. Between these radiating ridges are very fine concentric thread-like liræ, which pass up the sides of the former, and on the top are produced into scale-like processes, so that the valves, especially near the umbones, have a cancellated aspect. The colour is grey-white, varied with an opaque-white short ray at the apex of the beaks. The interior is either pure white or faintly tinged with yellow at the upper part. The texture of the shell is thin, so that the cancellated character of the external ornamentation is distinctly visible within. The lateral teeth are rather strongly developed on each side in both valves, each also having two cardinals. In the right the posterior tooth is twice as large as the anterior, and is bifid, as is also the front one in the left valve, in which the hinder tooth is inconspicuous in comparison with the rest. The pallial sinus is not very large, extending only a little beyond the middle of the valves. The outline at first ascends on leaving the scar, then descends obliquely, and finally slants backwards, forming rounded angles where the direction changes.

The largest specimen is 17 mm. long, 12½ high, and 6⅓ in diameter.

Tellina (*Arcopagia*) *elegantissima*, n. sp. (Pl. IV. figs. 3–3*b*).

Testa tenuis, albida vel pallide flavescens, ad umbones opaco-albo tincta, paulo inæquilateralis, transversim ovata, antice valde rotundata, postice angustior, acutior. Margo dorsi anticus leviter declivis et arcuatus, posticus paululum brevior, vix magis obliquus, subrectus. Margo ventris convexus, posterius haud flexuosus. Valvæ leviter convexæ, liris numerosis radiantibus tenuibus, alternatim majoribus, aliisque concentricis gracilioribus concinne sculptæ; lunula parva, profunda, lanceolata, sublævis: area valvæ sinistræ lævis, concava. Dentes cardinales lateralesque prominentes, tenues.

This species is very fragile, and so thin that the external reticulation of the surface is visible within the valves. It is a little inequilateral, broader and more rounded in front than behind, whitish or very pale yellowish excepting the tips of the umbones, which are opaque white. The dorsal margin is almost equally sloping on both sides, scarcely curved anteriorly, and almost straight behind. The lower or ventral outline is well curved, more gently ascending posteriorly than in front, and not sinuated. The surface of the valves is ornamented with a very fine network of delicate radiating thread-like liræ, which are generally alternately finer and coarser and crossed by still finer concentric elevated lines, the points of contact being a little thickened. The dentition of the hinge is almost precisely the same as in *Tellina pretiosa*, Deshayes, and the pallial scar is also very similar.

Length 15½ mm., height 12, diameter 6.

Habitat.—Torres Strait, in 3 to 11 fathoms.

From *Tellina pretiosa* of Deshayes, its nearest ally, this species is distinguished by being less acuminate posteriorly, more finely cancellated, and more inequilateral. The radiating costellæ in the species under consideration are more numerous, but the concentric ones, which are not elevated into scale-like projections on crossing the others, are fewer than in Deshayes' shell.

Tellina (?) *donacina*, Linné.

Tellina donacina, Linné, Syst. Nat., ed. 12, p. 1118.
Tellina donacina, Montagu, Test. Brit., pl. xxvii. fig. 3.
Tellina donacina, Wood, Gen. Conch., pl. xlv. fig. 5.
Tellina donacina, Philippi, Enum. Moll. Sicil., vol. i. p. 24.
Tellina donacina, Hanley, in Sowerby's Thesaurus, vol. i. p. 232, pl. lvi. fig. 12, and pl. lxvi. fig. 259.
Tellina donacina, Forbes and Hanley, Brit. Moll., vol. i. p. 292, pl. xx. figs. 3–4, Pl. K, fig. 4.
Tellina donacina, Jeffreys, Brit. Conch., vol. ii. p. 386, and vol. v. p. 187, pl. xli. fig. 4.
Tellina donacina, Sowerby, in Reeve's Conch. Icon., vol. xvii. pl. x. fig. 43.
Tellina donacina, Römer, Conch.-Cab., ed. 2, p. 26, pl. ix. figs. 8–12.
Tellina donacina, Bertin, Nouv. Arch. Mus. Paris, 1878, vol. i. p. 261.

Habitat.—Station 75, off Fayal, Azores, in 450 fathoms; volcanic mud.

Dr. Gwyn Jeffreys has shown that this species ranges from the north of England to the Mediterranean and Madeira, and is found fossil in the Coralline Crag and Subappenine Tertiaries. A fact in connection with this species which, I believe, has not been previously recorded, is the presence of a small internal ligament. This is especially noticeable in young shells, and is placed obliquely, as in the genus *Semele*, behind the cardinal teeth. Several other species also possess this feature, and among those obtained by the Challenger Expedition may be mentioned *Tellina tenuilirata*, Sowerby, *Tellina dilata*, n. sp., *Tellina fijiensis*, Sowerby, *Tellina casta*, Hanley, *Tellina languida*, n. sp., and *Tellina tenuilamellata*, n. sp. Two other species also have a portion of the ligament internal, but located, not obliquely as in the above species, but immediately beneath the beaks. These are *Tellina semen* of Hanley, and *Tellina semitorta* of Sowerby.

Although these forms differ from others in the genus in this respect, I do not deem it advisable to propose for them at present a new generic or subgeneric section. The gradations in form and general aspect from one genus to another are so slight that I feel convinced that a series of species of Tellinidæ could easily be got together which would clearly represent a gradual transition from group to group, so that it would be impossible to demonstrate where, on the one hand, *Tellina* proper, without any internal ligament, ended, and, on the contrary, where *Semele*, with a conspicuous internal cartilage, commenced. Similar gradations in respect of form, solidity, and dentition are also discoverable, so that it becomes quite a simple matter to graduate the forms of *Abra* into the genus *Semele*.

Tellina (?) *tenuilirata*, Sowerby.

Tellina tenuilirata, Sowerby, Copch. Icon., vol. xvii. fig. 219, *a*, *b* (*non* sp. 253).
Tellina tenuilirata, Angas, Proc. Zool. Soc. Lond., 1867, p. 919.

Testa parva, alba (interdum rosea), concentrice tenuiter striata, valde inæquilateralis, oblonga, postice acuminata, antice acute rotundata. Margo dorsi anticus elongatus, rectiusculus, vix descendens, posticus longe brevior, valde obliquus, subrectilinearis. Margo ventralis leviter curvatus, postice levissime incurvatus. Umbones parvi, acuti, circiter in $\frac{1}{3}$ longitudinis siti. Dentes cardinales duo inæquales in valva dextra, unicus triangularis in sinistra; laterales elongati, graciles. Ligamentum internum angustissimum, valde obliquum.

This species is moderately thin, white or pink, small, and sculptured with fine concentric lines of growth. It is nearly twice as long as high, very inequilateral, the small acute beaks being located at about one-third of the entire length from the hinder extremity. The anterior portion narrows slightly and is sharply rounded at the end, the posterior side being much more acuminated and somewhat wedge-shaped. The front dorsal margin is elongate, only a little oblique and straightish, the posterior much

shorter, also nearly rectilinear or feebly concave and much more sloping. The lower outline is only a little convex towards the anterior end, where it curves upwards, forming together with the down-curving end of the dorsal line a sharply rounded extremity. The ventral margin is straight or even a little incurved towards the narrowed end, and only slightly and gently ascending. The left valve has a single triangular subbifid cardinal tooth situated just a little anterior to the tips of the umbones. In the right valve there are two, whereof the hinder one is similar to that in the left, and placed immediately beneath the beak, so that when the valves are closed it has a posterior position to that of the left valve. The front tooth is smaller, narrower, and forms as it were the end of the lateral tooth. The side-teeth are elongate and well developed, and especially noticeable in the right valve, in front extending along the greater part of the dorsal margin. The internal ligament is small, narrow, placed behind the cardinal teeth, and slopes backwards. The pallial sinus is very elongate, extending almost as far as the anterior muscular impression.

Length 11 mm., height 6, diameter $2\frac{2}{3}$.

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms; also Flinders Passage, Torres Strait, in 7 fathoms; and Levuka, Fiji Islands, in 12 fathoms (Challenger); Sow and Pigs Bank, Port Jackson (Angas).

This interesting little species has all the external appearance of a *Tellinella*, but of course is quite distinct on account of the hinge-characters. The white variety is apparently more common than the rose-coloured, judging from the series of specimens at hand.

A second species described by Sowerby in his monograph of *Tellina* under this name, *Tellina tenuilirata* (Conch. Icon., species 253), is a large shell having much the form of *Tellina perna*, but differing in the character of the sculpture.

The specimens dredged in Flinders Passage and off Levuka are smaller than typical forms from Port Jackson, and are probably not full-grown. The latter series are very like those from the coast of New South Wales as regards form, but rather more coarsely striated, especially towards the hinder end. The shells from Flinders Passage are not quite so elongate as the others, or hardly so acuminate at the posterior extremity, still I believe it would be unwise to describe and name as distinct species forms presenting such slight differences.

Tellina (?) *fijiensis*, Sowerby.

Tellina fijiensis, Sowerby, Conch. Icon., vol. xvii. fig. 300.

Testa transversim oblonga, antice rotundata, postice angustata et emeata, compressa, valde inæquilateralis, nitida, concentrice confertim striata, interstitiis prope latus posticum paulo elevatis, sublamelliformibus, dilute salmonea vel lactea, maculis semipellucidi-

irregularibus aut pallidis vel sanguineis picta. Margo dorsi anticus elongatus, horizontalis, rectiusculus, posticus brevior, abrupte descendens, vix arcuatus; margo ventralis dorsali anteriori subparallelus, antice adscendens, postice interdum subsinuatus. Umbones acuti, prominentes, postmediani. Dentes cardinales inæquales, duo in utraque valva, laterales in utroque latere, cardinalibus haud remoti. Ligamentum externum breve, in fossa parva situm. Cartilago interna angusta, obliqua, postice inclinata. Sinus pallii profundissimus, cicatricem anteriorem fere attingens.

This species is nearly twice as long as high, rather compressed, of an oblong form, rounded anteriorly, narrowed and subacuminate behind. It is very inequilateral, thickish, either of a pale salmon tint marked with irregular sanguineous spots and streaks, or opaque white varied with similar markings of a pale semipellucid character. The front dorsal margin is almost horizontal, faintly concave close to the umbones, then straightish or very slightly excurved. The posterior is much shorter, a very little arched, especially at the upper part, and considerably oblique, forming at the extremity with the lower outline a sharpish angle which is most conspicuous in the left valve. The ventral outline is rather straight at the middle, exhibiting the slightest indication of a sinuation towards the hinder end, being considerably upcurved in front. The umbones are small, acute, and a little produced. The hinge consists of two cardinal teeth and two laterals in each valve, with an internal and an external ligament. The cardinals in the right valve are divergent from one another, with a triangular pit between them, the posterior being stouter than the other and somewhat cleft at the top. In the left valve the anterior is the stronger tooth and also somewhat bifid, the hinder one being thin, lamellar, and bordering the internal ligament. The lateral teeth are subequidistant and well developed. The external ligament is situated in a short sunken area behind the beaks, and consequently is very little if at all elevated above the margin. The internal cartilage is narrow, oblique, and posterior to the cardinal teeth. The pallial sinus is very deep, extending almost to the anterior muscular impression.

Length 10 mm., height $5\frac{1}{3}$, diameter $2\frac{1}{2}$.

Habitat.—Levuka, Fiji Islands, in 12 fathoms (Challenger); Island of Ngau, Fiji, at a depth of 10 fathoms on a sandy bottom (British Museum); Lord Hood's Island, in coral sand at low water (Cuming).

The elongate form of this species was probably the cause which induced Mr. Sowerby to locate it in the genus *Tellina*, but it might with equal propriety be included in *Semele*.

Tellina dilata, n. sp. (Pl. IV. figs. 7–7*b*).

Testa oblonga, postice angustata et subacuminata, antice acute rotundata, valde inæquilateralis, tenuis, nitida, alba aut flavescens, concentrice tenuissime striata, medio-

criter convexa. Margo dorsi anticus parum obliquus, subrectilinearis, vix excurvatus, posticus brevior, valde declivis, prope umbones levissime concavus, dein convexiusculus. Margo ventris late curvatus, postice subsinuatus. Dentes cardinales duo inaequales in utraque valva. Dentes laterales validi, elongati. Pallii sinus angustus, profundus. Ligamentum internum obliquum, angustum.

This species is small, thin, semipellucid, white or pale yellow, glossy and finely concentrically striated, the striæ being close and regular, and some of the interstices towards the posterior end slightly elevated and lamellar. It is somewhat convex, considerably inequilateral, of an elongate oval form, rather acuminate or shortly rostrate behind and sharply rounded in front. The posterior dorsal slope is very oblique, slightly concave immediately behind the small acute beaks and then faintly excurved. The anterior margin is much longer, almost straight, or very faintly arcuate at first, and finally curving into the ventral margin forms an acutely rounded end. The lower outline is broadly curved and indistinctly sinuated towards the hinder extremity. The hinge is composed of two cardinal teeth in each valve, whereof the posterior in the right and the anterior in the left are larger than the others and rather triangular. The laterals are well developed, and the pallial sinus is deep, reaching within a short distance of the anterior muscular impression.

Length 8 mm., height 5, diameter $2\frac{1}{2}$.

Habitat.—Station 185B, east of Cape York, North Australia, in 155 fathoms; coral sand.

Tellina (?) *casta*, Hanley.

Tellina casta, Hanley, Proc. Zool. Soc. Lond., 1844, p. 63.
Tellina casta, Hanley, Sowerby's Thesaurus, vol. i. p. 253, pl. lvi. fig. 9.
Tellina casta, Sowerby, Conch. Icon., vol. xvii. fig. 269.
Tellina (*Arcopagia*) *casta*, Romer, Monogr. Conch.-Cab., ed. 2, p. 95.

Habitat.—Torres Strait, in 3 to 11 fathoms (Challenger); Singapore (Hanley).

This species is described as inequivalve, and it is the left valve which is a trifle more convex than the right. The dorsal margins are correctly said to be "on either side nearly straight, moderately and nearly equally sloping." From this description it will be seen that Sowerby's figure is somewhat inaccurate, giving a too decided convexity to the anterior slope. There are two diverging cardinal teeth in the right valve, the posterior of which is much the larger and bifid, and the lateral grooves are strongly marked on both sides. On the contrary, in the left valve the anterior is the larger of the two, and likewise cleft. The ligament projects but very little, and a portion of it forming an internal cartilage is situated in a narrow pit just behind the cardinal teeth.

Tellina (?) *languida*, n. sp. (Pl. IV. figs. 8–8*b*).

Testa parva, tenuis, alba, pellucide zonata, nitida, incrementi lineis tenuissime striata, inæquilateralis, ovata, postice acuminata. Margo dorsi anticus vix obliquus, levissime convexus, posticus valde declivis, rectilinearis. Ventris margo antice arcuatus, postice lente vix arcuatim adscendens. Umbones parvi, acuti, prominuli, postmediani. Dentes cardinales duo in utraque valva, quorum unus triangularis, bifidus. Dentes et fossa laterales graciles, remoti. Ligamentum parvum, partim internum. Sinus pallii permagnum, profundum.

This species is very like *Tellina casta* with regard to sculpture, colour, and the character of the cardinal teeth and ligament. It is, however, of a different form. It is decidedly more inequilateral, has the anterior end higher and more broadly rounded, the dorsal slope on that side less straight, and the posterior end more acuminate. The lateral teeth are also more remote and less pronounced. It is of an irregular ovate form, narrowed and pointed behind. It is considerably inequilateral, glossy, finely concentrically striated, moderately convex, white varied with a few semitransparent zones. The front dorsal margin is a very little convex and only slightly oblique, the posterior being almost rectilinear and very slanting. The lower outline is broadly arcuate, more rapidly upcurving in front than posteriorly, where the ascent is straightish, scarcely incurved. The umbones are small, acute, a little elevated and worn at the extreme tip. The pallial sinus is very wide and deep, and extends three-fourths of the way across the valves. There are two cardinal teeth in each valve, whereof the posterior in the right and the anterior in the left are much stouter than the others, and bifid.

Length 9 mm., height 7, diameter $4\frac{1}{2}$.

Habitat.—Torres Strait, in 3 to 11 fathoms, and Flinders Passage, in 7 fathoms.

Tellina (?) *tenuilamellata*, n. sp. (Pl. IV. figs. 9–9*b*).

Testa rotundata, æquilateralis, tenuis, semipellucida, alba, lineis opacis albis radiantibus tenuissimis disjunctis ornata, antice regulariter curvata, postice paulo angustior, lamellis angustissimis concentricis instructa. Margo dorsi utrinque declivis, leviterque convexus. Margo ventralis late arcuatus, posterius vix sinuatus. Umbones ad apicem plerumque erosi, aliquanto prominentes. Dentes cardinales duo in utraque valva, postico valvæ dextræ valde bifido. Laterales conspicui, anteriori cardinalibus subapproximato.

This species is a little longer than high, rather roundish, well rounded in front and indistinctly pointed behind. It is very thin, fragile, and semitransparent, so that the external sculpture and markings are seen through on the inner surface. It is almost equilateral, whitish, or faintly tinged with yellow, ornamented with excessively fine

interrupted radiating opaque white lines which are visible to the naked eye. The sculpture consists of very thin narrow concentric lamellæ, and extremely fine intervening concentric striæ, which, however, are only to be seen with the aid of a compound microscope. The umbones are a little prominent, and in the three valves under examination worn away at the extreme apex. The dorsal margin is somewhat oblique on both sides, a little arcuate in front, but rather straighter behind. The lower outline is well curved, exhibiting only the faintest indication of a posterior sinuation. The hinder cardinal tooth of the right valve is deeply cleft, and the lateral teeth are well developed, the anterior being rather nearer the apex than the posterior. The internal ligament is small, narrow, and located obliquely against the hinder cardinal tooth of the left valve, in the right being separated from the posterior tooth by a narrow pit which receives the corresponding tooth of the other valve. The muscular scars and pallial sinus are very indistinct, as is often the case in thin shells.

Length 9 mm., height $7\frac{1}{2}$, diameter $4\frac{1}{2}$.

Habitat.—Station 188, south of New Guinea, at a depth of 28 fathoms; green mud.

The valves here described are not probably full grown, but are sufficiently peculiar to warrant their description.

Tellina (?) *semen*, Hanley.

Tellina semen, Hanley, Proc. Zool. Soc. Lond., 1844, p. 164.
Tellina semen, Hanley, in Sowerby's Thesaurus, vol. i. p. 249, pl. lvi. fig. 8.
Tellina semen, Römer, Conch.-Cab., ed. 2, p. 95 (*non Tellina semen*, Sowerby, Conch. Icon., vol. xvii. fig. 232).

Habitat.—Flinders Passage, in 7 fathoms, and Station 187, near Cape York, Torres Strait, in 6 fathoms; also Levuka, Fiji Islands, at a depth of 12 fathoms.

The locality of this species has not, I believe, been hitherto recorded. *Tellina semitorta*, Sowerby, is closely allied, being very similarly sculptured, but of a rather more elongate form. The shell figured by Sowerby as *Tellina semen* is, on the contrary, too short and too high for the present species. Both of these forms have a small internal ligament immediately beneath the umbones, showing an approach to the genus *Semele*.

Tellina (?) *semitorta*, Sowerby.

Tellina semitorta, Sowerby, Conch. Icon., vol. xvii. figs. 221, *a*, *b*.

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms.

This species is elongate, rather *Donaciform*, very inequilateral, moderately convex, equivalve, white, marked with very fine irregularly radiating, interrupted and wrinkly pellucid lines which are invisible to the naked eye. The front dorsal margin is very long, only slightly sloping and almost rectilinear. The posterior is only about half as long,

very oblique, and also very little excurved. The ventral outline is very gently arcuate, upcurving at both ends, forming rounded extremities. When the shell is viewed with the posterior end towards the eye the lower edges of the valves are seen to be slightly tortuous near that part, whence the species has derived its name. The surface of the valves is finely concentrically striated, the sculpture at the hinder part being somewhat finer than in *Tellina semen* of Hanley. The ligament is short, yellow, and prominent. The anterior lateral teeth and the plate supporting the ligament are tinged with pale red, the corresponding parts in *Tellina semen* being white. The pallial sinus is large, deep, rounded at the end, and reaches almost to the front muscular scar.

In Sowerby's figure 221, *a*, the anterior dorsal slope and the ventral outline are rather too convex, so that the form appears somewhat too short.

The types of this species, liberally presented to the national collection by Mr. G. F. Angas, were dredged in Watson's Bay, South Wales.

Family Donacidæ.

Donax, Linné.

Donax nitidus, Deshayes.

Donax nitida, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 350.
Donax nitida, Reeve, Conch. Icon., vol. viii. fig. 34.
Donax nitidus, Römer, Conch.-Cab., ed. 2, p. 51 (*non Donax nitidus*, Sowerby, Thesaurus, vol. iii. p. 314, pl. cclxxxii. fig. 75).

Habitat.—Port Jackson, Sydney, in 6 to 15 fathoms, and Station 187, near Cape York, North Australia, in 6 fathoms.

This species was originally described from specimens said to have been collected at Moreton Bay. It is well characterised by its slender form, its smooth glossy surface, and the conspicuous coarse arcuate sulci and intermediate ridges down the posterior end.

These do not extend quite to the dorsal margin, thus leaving a smooth lanceolate area, which does not, however, extend to the posterior extremity of the shell. Although the valves appear smooth and glossy to the naked eye, they nevertheless are ornamented with excessively fine radiating white substriæ, such as obtain in many species of the genus. The colour of this species is white, varied with two short livid brown rays and a brownish stain upon the sulcated end of the valves. These markings are also faintly visible within the valves, which are otherwise white inside and finely denticulated along the faintly curved ventral margin. M. Deshayes described this species as totally white, with the exception of a pale violet flesh-coloured lunule. This is not, however, correct, either as regards the types in the Cuningian collection or the Challenger specimens, all of which exhibit the rays above mentioned.

Family PETRICOLIDÆ.

Petricola, Lamarck.

Petricola lapicida (Chemnitz) juv.

Venus lapicida, Chemnitz, Conch.-Cab., vol. x. p. 356, figs. 1664, 1665.

Habitat.—Flinders Passage, North Australia, in 7 fathoms; also Station 186, off Cape York, Torres Strait, in 8 fathoms.

Only one or two small valves were collected. At this early stage of growth the peculiar sculpture of this species is very fine indeed. Its occurrence in Torres Strait and its distribution have been already recorded by the author in the Report on the "Alert" collections, p. 98.

Venerupis, Lamarck.

Venerupis irus (Linné).

Donax irus, Linné, Syst. Nat., ed. 12, p. 1126.
Donax irus, Donovan, Brit. Shells, vol. i. pl. xxix. fig. 2.
Venerupis irus, Lamarck, Anim. sans vert., ed. 2, vol. vi. p. 163.
Venerupis irus, Forbes and Hanley, Brit. Moll., vol. i. p. 156, pl. vii. figs. 1–3, and Pl. G. fig. 2.
Venerupis irus, Jeffreys, Brit. Conch., vol. iii. p. 86, vol. v. pl. li. fig. 5.
Venerupis irus, Sowerby, Thesaurus, vol. ii. p. 763, pl. clxiv. fig. 1, and pl. clxv. figs. 31, 32.
Venerupis irus, Pfeiffer, Conch.-Cab., ed. 2, Monog. Veneracea, p. 245, pl. xxxi. figs. 17–19.
Venerupis irus, Sowerby, Conch. Icon., vol. xix. fig. 22.

Habitat.—Tenerife, Canary Islands, at a depth of 70 fathoms.

This well-known form has previously been recorded from the Canary Islands, and may eventually be found still farther south. It does not appear to range farther north than some parts of England and Ireland. It has received many names, and to give the complete synonymy and list of references would be useless; this being only advisable when a monograph is attempted.

Family VENERIDÆ.

Subfamily TAPESINÆ.

Tapes, Megerle.

Tapes obscurata, Deshayes.

Tapes obscurata, Deshayes, Proc. Zool. Soc. Lond., 1853, p. 9; Cat. Conchif. Brit. Mus., p. 169.
Tapes obscurata, Reeve, Conch. Icon., vol. xiv. fig. 12.
Tapes grata, Deshayes, Proc. Zool. Soc. Lond., 1853, p. 9; Cat. Conchif. Brit. Mus., p. 170.
Tapes similis, Reeve, (non Deshayes), Conch. Icon., fig. 10.
Tapes quadriradiata, Deshayes, Proc. Zool. Soc. Lond., 1853, p. 9; Cat. Conchif. Brit. Mus., p. 171.
Tapes quadriradiata, Reeve, *loc. cit.*, fig. 6.
Tapes quadriradiata, Römer, Monogr., p. 51, pl. xviii. fig. 2.
Venus quadriradiata, Pfeiffer, Conch.-Cab., ed. 2, p. 199, pl. xxxii. fig. 6.

Habitat.—Amboina, in 15 to 20 fathoms (a single dead valve).

There appears to me little doubt that the above so-called species are but variations of one and the same form. I do not find any distinguishing characters in the outline or the sculpture, all are finely concentrically sulcate-striate towards the umbones, the grooving becoming gradually stronger and further apart as the shell enlarges, especially towards the hinder end of the valves. The posterior dorsal margin is well arched, curving into the lateral outline without any perceptible angle. In addition to the concentric sculpture, there are generally (not always) traces of faint radiating substriæ, more or less visible when the shell is viewed in certain positions. The colour-ornamentation may vary in intensity and definition, but in general arrangement and character it is the same. All the varieties exhibit four more or less well-pronounced and interrupted rays, besides a somewhat zig-zag reticulation of dark lines very indistinct in the type (*Tapes obscurata*), more apparent in the variety *Tapes grata*, and most conspicuous in the form named *Tapes quadriradiata*.

The ornamentation of the lunule is fairly constant in all. It consists of short violet-brown lines crossing transversely to the length. They do not extend beyond the impressed circumscribing line, and consequently the lunule has a very clear definition.

The posterior dorsal area is also somewhat similarly marked, but not so distinctly, the colour of the lineation being rather paler. The dark blotch or stain near the centre of this portion of the surface, mentioned by Deshayes and Römer in their descriptions of *Tapes quadriradiata*, is also traceable in *Tapes obscurata* and *Tapes grata*, although unnoticed by the latter author, and indeed in all specimens there is a second smaller blotch nearer the umbones. *Tapes similis* of Deshayes (= *Tapes grata* of Reeve and Römer) I regard merely as a small, finely sculptured form of the West African *Tapes dura* of Gmelin. The *Tapes obscurata* of Römer does not apparently belong to the present species, nor do I consider his *Tapes similis* the same as *Tapes grata*, Deshayes.

Reeve in his monograph of this genus reversed the names of these two last species, his *Tapes similis* being in fact the type of *Tapes grata*, and his fig. 9 representing the true *Tapes similis*. This confusion has no doubt misled Römer in his identifications.

Tapes (*Paratapes*) *textrix* (Chemnitz).

Venus textrix, Chemnitz, Conch.-Cab., vol. vii. p. 48, pl. xlii. fig. 442.
Tapes textile, (Gmelin) Sowerby, Thesaurus, vol. ii. p. 681, pl. cxlvi. figs. 26–28.
Tapes textrix, Reeve, Conch. Icon., vol. xiv. fig. 3.
Tapes textrix, Römer, Monogr., p. 19, pl. v. fig. 1.

Habitat.—Port Jackson, New South Wales, in 4 to 18 fathoms.

Specimens from this part of the coast of Australia differ slightly from Indian Ocean examples in the style and tone of the painting, agreeing better with *Tapes undulata* than with *Tapes textrix*. The upper part of the valves is of a pale yellowish-brown tint

varied with very little of the network markings which occur in both forms. Towards the outer margin, however, they are more prevalent and of the same violet colour as in *Tapes undulata*. The lunule also in these Port Jackson specimens is narrower than in typical examples of *Tapes textrix*, the dark red-brown lines upon this part and the dorsal area being likewise less vivid. Another feature in which they differ from the typical form is in the margins of the valves being thinner, in this respect more resembling *Tapes undulata* than *Tapes textrix*, the latter having peculiarly smooth and much thickened edges. Thus it will be seen that the shells under examination in some characters are very like Born's species, still they have not the slightly oblique striæ upon the middle of the valves, which is so characteristic a mark of that form, nor are they quite so narrow at the extremities.

Tapes textrix is found on the Malabar coast (Chemnitz), Andaman Islands (E. Hamilton, in Brit. Mus.), and probably other places in the Indian Ocean.

Tapes (*Paratapes*) *undulata* (Born).

Venus undulata, Born, Test. Mus. Cæsar. Vindobon., p. 67.
Tapes undulata, Reeve, Conch. Icon., vol. xiv. fig. 8.
Tapes (*Textrix*) *undulata*, Römer, Monogr., p. 20, pl. v. fig. 2.
Venus rimosa, Philippi, Abbild., vol. iii. p. 77, pl. vii. fig. 7.
Tapes rimosa, Sowerby, Thesaurus, vol. ii. p. 682, pl. exlvi. fig. 29.

Habitat.—Station 189, Arafura Sea, in 25 fathoms; also Station 233A, off Kobé, Japan, in 8 to 50 fathoms.

This species has already been recorded from Japan and China, and in the British Museum I find specimens collected at Ceylon by E. W. H. Holdsworth, Esq. Although closely resembling *Tapes textrix* it is well distinguished by the difference of sculpture.

Tapes (*Paratapes*) *semirugata* (Philippi).

Venus semirugata, Philippi, Abbild., vol. iii. p. 76, pl. vii. fig. 4.
Tapes semirugata, Sowerby, Thesaurus, vol. iii. p. 681, pl. exlv. fig. 12.
Tapes (*Textrix*) *semirugata*, Römer, Monogr., p. 29, pl. ix. fig. 1.
Tapes polita, Sowerby, *loc. cit.*, p. 682, pl. exlv. figs. 15, 16.
Tapes polita, Reeve, Conch. Icon., vol. xiv. fig. 49.

Habitat.—Station 188, south of New Guinea, in 28 fathoms, on a mud bottom.

The single specimen from this locality agrees in all respects with Römer's admirable description, but has the four interrupted rays rather more decided than in the specimen he figures. *Tapes polita* of Sowerby is merely the younger state of

this species, in which the concentric sulci are only beginning to develop. The brown apices to the umbones referred to by him are probably characteristic of this species, as I find them in the specimen before me.

Sowerby observes that the "inside is orange under the umbones and marked with grey near the margin."

On examining the type of his species I find the colour beneath the beaks is scarcely deep enough for orange, but should rather be called gamboge-yellow, and the grey markings near the margin are the exterior zig-zag lines, which are not hidden by an internal white shelly coating as in adult shells. His specimen is said to have been dredged near Sydney, at a depth of 6 fathoms, on a mud bottom.

Tapes (*Amygdala*) *intermedia* (Quoy and Gaimard).

Venus intermedia, Quoy and Gaimard, Voy. de l'Astrolabe, Mollusques, vol. iii. p. 526, pl. lxxxiv. figs. 9, 10.
Venus intermedia, Hanley, Cat. Biv. Shells, p. 127, Appendix, p. 358, pl. xvi. fig. 41.
Venus largilliarti, Philippi, Abbild., vol. iii. p. 60, pl. ix. fig. 3.
Tapes intermedia, Sowerby, Thesaurus, vol. ii. p. 692, pl. exlvi. fig. 40.
Tapes intermedia, Reeve, Conch. Icon., vol. xiv. fig. 59.
Tapes intermedia, Hutton, Manual New Zealand Moll., p. 151.
Tapes (*Amygdala*) *intermedia*, Römer, Monogr., p. 83, pl. xxix. fig. 2.

Habitat.—D'Urville Island, New Zealand, on the beach.

This is a well-known species of a pale whitish-brown colour, and, according to Hutton, common at the Auckland Islands.

Tapes (*Amygdala*) *fabagella*, Deshayes.

Tapes fabagella, Deshayes, Proc. Zool. Soc. Lond., 1853, p. 10.
Tapes fabagella, Deshayes, Cat. Conchif. Brit. Mus., p. 182.
Tapes fabagella, Reeve, Conch. Icon., vol. xiv. fig. 66.
Tapes fabagella, Römer, Monogr., p. 91, pl. xxxi. fig. 2.
Tapes fabagella, Hutton, Manual New Zealand Moll., p. 151.

Habitat.—Port Jackson, New South Wales, in 2 to 10 fathoms.

This species is also found at Lake Macquarie, New South Wales, and off the Tasmanian coast. Mr. G. French Angas, who is well known as the author of several papers on the Molluscan fauna of Australia, liberally presented specimens to the British Museum, from the former locality, and the same institution is indebted to Mr. R. Gunn for others from the latter. The original habitat, "New Zealand," assigned to this species has not yet been confirmed, and it is somewhat doubtful whether it be correct.

Tapes (*Amygdala*) *exalbida* (Chemnitz).

Venus exalbida, Chemnitz, Conch. Cab., vol. xi. p. 225, pl. ccii. fig. 1974.
Venus exalbida, Sowerby, Thesaurus, vol. ii. pl. clxi. fig. 193.
Venus exalbida, Reeve, Conch. Icon., vol. xiv. fig. 13.
Chione exalbida, Deshayes, Cat. Conchif. Brit. Mus., p. 154.

Habitat.—Station 316, off the east side of the Falkland Islands, in 4 to 5 fathoms; mud.

This species is also quoted as coming from the Strait of Magellan by Sowerby and Reeve. It attains a large size, measuring at times as much as 110 mm. in length. Young shells are more squarely truncate posteriorly than full-grown examples, which become almost subrostrate at the extremity. The form of the lunule also alters from roundly cordate in the young to broad lanceolate in the adult. Römer places this species in his section of *Venus* which he has named *Katelysia*.

Subfamily Venerinæ.

Venus, Linné.

Venus philomela, n. sp. (Pl. II. figs. 7–7*b*).

Testa ovata, inæquilateralis, antice brevior, alba, versus umbones interdum purpureo-roseo tincta, concentrice tenuiter lirata. Lunula anguste cordata, linea impressa circumscripta. Umbones parvi, parum prominentes, ad apicem læves. Cardo dentibus tribus in utraque valva instructus, in dextra postremo, in sinistra mediano bifido. Margo valvarum intus minute denticulatus. Impressiones musculares irregulariter ovatæ, anteriori paulo angustiori. Sinus pallii parvus, brevis, triangularis.

This shell is of a transversely ovate form, narrower in front than behind, moderately thick and decidedly inequilateral, the apex of the beaks being situated at a point marking off three sevenths of the entire length of the shell from the anterior end. The latter narrows to a somewhat sharply rounded extremity. The front dorsal slope is very oblique, rather rectilinear at first, then gradually curving into the arcuate end. The posterior dorsal margin is almost horizontal, nearly straight for some distance until it commences to descend and curve, forming the broadly rounded lateral margin. The ventral outline is widely arcuate, curving up equally at both ends.

The umbones are small, smooth, glossy, incurved and directed anteriorly. The lunule is rather narrow, striated by the fine terminations of the concentric ridges which are interrupted by a distinct impressed line or stria which limits the lunule. There is scarcely any posterior dorsal area, it being very narrow, linear, and not defined. The hinge consists of three diverging teeth in each valve. Those of the right are unequal, the front one being smallest, lamellar, subparallel with the margin of the valve, the

central one most elevated, triangular, the hindmost being nearly as large, posteriorly oblique, and somewhat bifid at the top. In the left valve both the anterior and posterior teeth are slender, the central one being stout and distinctly bifid. The concentric lirae are very fine at first, gradually increase with the growth of the shell, are rather sharp and up-turned so that they are rough to the touch, the finger being passed from the umbo downwards. They attenuate at the sides, and number about thirty-three in a specimen measuring 9 mm. in height. The muscular impressions are subequal, the anterior rather narrower than the posterior, and situated a little lower down. The sinus in the pallial scar is small and angular. The crenulation of the margin is so fine that it is only just visible to the naked eye, and commencing in front beneath the umbones extends all round except along the posterior dorsal slope. The ligament is wanting in all the valves obtained, but is probably small, judging from the remains and the groove wherein it rests. The colour within and without is either totally white or more or less stained with purplish-rose in the umbonal region.

Length 12½ mm., height 10, diameter 6¾. Another specimen is 12 mm. long, 9½ high, and 6 in diameter.

Habitat.—Nightingale Island, Mid South Atlantic, 100 to 150 fathoms.

This species recalls to mind the *Venus gayi* of Hupé, a Chilian and West Patagonian species, which, contrary to that now described, has the hinder end more acuminate than the anterior, the posterior slope more oblique, is rather more solid, has a more coarsely crenulated inner margin to the valves, and less acute stronger concentric ridges. In addition to these differences there are others in the hinge, muscular scars, and pallial sinus.

Venus torresiana, Smith (Pl. III. figs. 1–1*c*).

Venus torresiana, Smith, Report Zool. Coll. "Alert," p. 94, pl. vi. figs. M–M2.

Testa transversa, antice rotundata, postice subtruncata, alba, obsolete rufo radiatim maculata, ad apices et lunulam rufescens, concentrice lirata, infer liras radiatim striata, paulo inæquilateralis. Margo dorsalis anterior arcuatus ad finem lunulæ leviter incisus, posterior paululum obliquus, rectiusculus, postice subangulatus. Extremitas antica rotundata, postica arcuatim subtruncata, latior, ventralis late curvata. Lunula elongato-cordiformis, perspicue circumscripta, concentrice lamellatim striata. Area angusta, striata. Lamellæ concentricæ antice et in medio liriformes, postice tenues, elevatæ. Dentes cardinales tres in utraque valva, in dextra posteriori, in sinistra mediano aliquanto bipartito. Sinus pallii mediocris, triangularis. Margo internus valvarum concinne denticulatus.

The form of this species is longer than high and somewhat inequilateral, the anterior end being rather the shorter. The length increases much more than the height as the

shell enlarges. The front dorsal margin may be described as a little arcuate and interrupted by a slight notch at the groove which circumscribes the lunule. The posterior margin does not descend so much in young specimens, and is very nearly rectilinear. The hinder extremity is somewhat squarish, very feebly rounded, forming an obtuse angle above, and curving more gently into the ventral margin which is but little arcuate in the middle. The umbones are only a little prominent, generally tinged with red, and curved over towards the front. The lunule also is generally stained with light red, especially anteriorly. It is of a longish heart shape, prominent and very distinctly parted off from the rest of the surface by a groove which cuts through the concentric costellæ, the fine ends of which form the only ornamentation of the lunule. These costellæ are rather close together in some specimens and more remote in others, in front and upon the central portion of the valves being in the form of fine rounded ridges and posteriorly become lamellar, thin, and erect. The radiating striæ are fine, cover the entire surface with the exception of the lunule and the narrow posterior area. A few towards the hinder extremity are rather closer together than the rest, and others at the opposite end crossing the concentric ridges give them a crenulated aspect. The two front teeth in the right valve slope towards the anterior end. Of these the anterior is the more slender, lamellar, and subparallel with the outer margin of the valve, the other being more divergent. The third tooth is considerably stouter, has a posterior inclination, is distinctly bifid at the top and quite separated from the neighbouring tooth. In the left valve the central one is much the stoutest, situated very slightly posterior to the apex of the umbo, and also bipartite. The hindmost tooth is the smallest, thin, and almost bounds the ligament. The front one is also rather thin, very divergent anteriorly from the central tooth. The front muscular scar is elongate, subpyriform, and narrower than the posterior, which is of a roundish pear shape. The pallial sinus is moderately deep, acutely rounded at the apex. The crenulation of the margin within the valves is fine, especially at the hinder extremity, whilst upon that portion which includes the lunule it is especially coarse, and consists of elongate transverse denticles.

Length 7 mm., height $5\frac{1}{2}$, diameter $3\frac{2}{3}$.

Habitat.—Station 187, off Cape York, North Australia, in 6 fathoms; coral mud.

Only young specimens of this species were obtained at the above locality, and the dimensions given do not approach those of more adult examples in the British Museum dredged by Dr. Coppinger of H.M.S. "Alert" at Thursday Island, Torres Strait. The largest of these has a length of 19 mm., is 15 high, and $10\frac{1}{2}$ in diameter. The form alters considerably with the growth of the shell. In the earlier stages the posterior end is broader than the anterior and subtruncate, the hinder dorsal margin being also less oblique than that in front. On the contrary, in more adult shells the hinder extremity becomes even narrower than the front, and the dorsal slope on the latter side is hardly so descending as that on the former.

Venus (*Ventricola*) *casina*, Linné.

Venus casina, Forbes and Hanley, Brit. Moll., pl. xxiv. figs. 1, 5, 6.
Venus casina, Reeve, Conch. Icon., fig. 15.
Venus casina, Sowerby, Thes. Conch., pl. clx. figs. 177–180.

Habitat.—Tenerife, Canary Islands, at a depth of 70 fathoms; also Station 75, off Fayal, in 450 fathoms.

Only a single small valve was dredged at the latter locality. Mr. MacAndrew obtained this species at Porto Santo, Madeira, and it is found in the Mediterranean and as far north as Norway.

Venus (*Ventricola*) *effossa*, Bivona.

Venus effossa (Bivona) Philippi, Moll. Sicil., vol. i. p. 43, pl. iii. fig. 20, vol. ii. p. 34.
Venus effossa, Deshayes, Cat. Conchif. Brit. Mus., p. 100.
Venus (*Chione*) (*Ventricola*) *effossa*, Römer, Mal. Blatt., 1867, vol. xiv. p. 124.

Habitat.—Tenerife, Canary Islands, in 70 fathoms; also Station 75, off Fayal, Azores, in 450 fathoms.

Only a few odd valves of very young shells were obtained at the latter Station. In this immature condition they do not exhibit the characteristic sunken lunule.

Venus (*Antigona*) *puerpera*, Linné, var.

Venus puerpera, Linné, Mantissa, p. 545.
Venus puerpera, Sowerby, Gen. Rec. and Foss. Shells, fig. 1.
Venus puerpera, Sowerby, Thes. Conch., p. 703, pl. clii. fig. 1.
Venus puerpera, Reeve, Conch. Icon., pl. iv. fig. 10.
Venus puerpera, Pfeiffer, Conch.-Cab., ed. 2, p. 145, pl. 10, figs. 4, 5.

Habitat.—Reefs off Tongatabu, July 21, 1874.

The shells from this locality differ only from the typical form of the species in having no purple stain within the valves at the posterior end. In the British Museum a specimen from the Andaman Islands varies in the same manner, and others from the Fiji Islands and Torres Strait are intermediate with respect to this coloration, having only two small purple marks near the muscular scar. A character which appears to be pretty constant both in the type and this variety is the V-shaped purple mark upon the apex of the umbones. This feature I also find present in *Venus resticulata*, Sowerby, *Venus agrota*, Reeve, *Venus lacerata*, Hanley, *Venus magnifica*, Hanley, and would probably be met with in young fresh specimens of *Venus sowerbyi*, Deshayes, and *Venus clathrata*, Deshayes. In *Venus crispata*, Deshayes, and *Venus listeri*, Gray, it does not appear to be present, judging from the few specimens examined. All the above-mentioned forms have the

posterior dorsal area channelled in each valve, and the dextral one overlaps the left posteriorly. All are more or less distinctly four-rayed, in some instances, as in *Venus magnifica* and *Venus reticulata*, only towards the umbones. After comparing closely these various forms, I am of opinion that no constant differences would be found whereby they might be separated if a very large series, say a thousand specimens from various localities, were studied. They appear to be races, just as the genus *Homo* is represented by numerous races. The typical *Venus puerpera* probably never attains the large size of the variety *Venus clathrata*, yet an intermediate is seen in *Venus listeri*, so that a large specimen of the latter and a small one of the former resemble one another, and in fact are the same species. The wider and more lamelliform ribs on the posterior side of *Venus listeri* vary considerably, and I do not consider this sufficient to mark that form as a distinct species, and it is even questionable whether *Venus multicostata*, Sowerby, from Panama, should be separated. The typical form of *Venus magnifica* is very remarkable on account of the purplish tone of its external colouring, which in itself is not a sufficient specific difference, seeing how variable this form is in this respect. The form of the shell may vary from nearly globular to transversely quadrate-ovate, and the pallial sinus is more acute in some specimens than others.

Venus (*Antigona*) *lamellaris* (Schumacher).

Antigona lamellaris, Schumacher, Essai, p. 155, pl. xiv. fig. 2.
Dosina lamarckii, Gray, Analyst, vol. viii. p. 308.
Venus lamarckii, Reeve, Conch. Icon., fig. 39, *a*, *b*.
Venus lamarckii, Pfeiffer, Conch.-Cab., ed. 2, p. 142, pl. viii. figs. 10, 11.
Venus lamarckii, Sowerby, Thesaurus, pl. cliii. figs. 20, 21.
Venus subrostrata, Wood, Ind. Test. Suppl., p. 58, pl. ii. fig. 7.
Venus subrostrata, Reeve, Conch. Syst., pl. lxviii. fig. 4.
Venus nodulosa, Sowerby, Thes. Conch., p. 708, pl. cliii. fig. 16.

Habitat.—Torres Strait, in 5 to 11 fathoms.

This species has also been recorded from Japan, China, and Wide Bay, East Australia.

Venus (*Anaitis*) *paphia*, Linné, var.

Venus paphia, Linné, Syst. Nat., ed. 12, p. 1129.
Venus paphia, Reeve, Conch. Syst., vol. i. pl. lxviii. fig. 1.
Venus paphia, Reeve, Conch. Icon., vol. xiv. pl. xix. fig. 89, and pl. xxiii. fig. 116*a* (as *Venus cypria*, Sowerby).
Venus paphia, Sowerby, Thes. Conch., p. 720, pl. clv. fig. 61.
Venus paphia, Pfeiffer, Conch.-Cab., ed. 2, p. 130, pl. vii. figs. 4–6.
Venus paphia, Carpenter, Report Moll. West Coast North America, 1864, p. 571.

Habitat.—St Vincent, Cape Verde Islands, in 7 to 20 fathoms (Challenger, and J. Macgillivray in Brit. Mus.).

The variety of this well-known West Indian species from the Cape Verde Islands is not so prolonged and acuminate posteriorly as the normal form, the concentric ribs are not so interrupted and lamellar behind, and the valves are ornamented with four brown rays, three being the usual number. *Venus cypria*, Sowerby, from the west coast of Central America, I regard as a variety of this species, and *Venus varicosa* of the same author appears to be another form of it with the concentric ribs excessively thickened.

Venus (*Chione*) *calophylla*, Philippi.

Venus calophylla, Philippi, Wiegmann's Archiv für Nat., 1836, vol. i. p. 229, pl. viii. fig. 2.
Venus calophylla, Hanley, Cat. Rec. Biv., Append., p. 361, pl. xvi. fig. 26.
Venus calophylla, Reeve, Conch. Icon., pl. xxiii. fig. 114.
Venus calophylla, Sowerby, Thes. Conch., vol. ii. p. 724, pl. clx. fig. 176.
Venus thiara, Sowerby, Gen. Rec. and Foss. Shells, fig. 3.
Venus thiara, Reeve, Conch. Syst., vol. i. pl. lxvii. fig. 3.
Venus (*Anaitis*) *calophylla*, Römer, Mal. Blätt., 1865, vol. xii. p. 157.
Venus (*Circomphalus*) *calophylla*, H. and A. Adams, Genera, vol. ii. p. 422.
Venus cumingii, Sowerby, Thes. Conch., vol. ii. p. 725, pl. clvii. fig. 122.

Habitat.—Station 187, west of Cape York, North Australia, in 3 to 28 fathoms; Station 203, Philippine Islands, in 20 fathoms; and Port Jackson, Sydney, in 4 to 18 fathoms.

This species is very variable in the number of the concentric lamellæ. In a specimen from China there are only twelve, whilst in another of equal size from North-east Australia there are as many as twenty-eight. *Venus cumingii* certainly cannot be regarded in any other light than as a mere variety. The extra rotundity in the type is in a great measure due to its being a young shell, which if allowed to have arrived at maturity would no doubt have prolonged the hinder end of the shell as is the case with this species.

Venus (*Chione*) *foliacea*, Philippi.

Venus foliacea, Philippi, Abbild., vol. ii. p. 107, pl. v. fig. 1.
Chione foliacea, Deshayes, Cat. Conchif. Brit. Mus., p. 122.
Venus thiara, Sowerby, Thes. Conch., vol. ii. p. 723, pl. clviii. figs. 125–130.
Venus thiara, Reeve, Conch. Icon., pl. xxiii. figs. 109, 110.
Chione retroversa, Deshayes, Cat. Conchif. Brit. Mus., p. 123.
Venus (*Anaitis*) *foliacea*, Römer, Mal. Blätt., 1865, vol. xii. p. 160.

Habitat.—Stations 186, 187, and 189, all in the region of Torres Strait, North Australia, at depths varying from 3 to 28 fathoms (Challenger); Japan, Port Curtis, Queensland, Ceylon (British Museum); Red Sea and Madagascar (Philippi).

This species, although very closely related to *Venus tiara* (Dillwyn, auct.), may perhaps be sufficiently distinguishable. The specimens figured by Sowerby and Reeve are remarkable for the development of the posterior lobe of the concentric lamellæ, and

approach very closely to *Venus calophylla*. Römer is wrong, in my judgment, in considering figs. 125 and 126 of the Thesaurus as representing *Venus tiara*.

Venus (*Chione*) *jacksoni*, n. sp. (Pl. III. figs. 2–2*e*).

Testa transversim ovata, utrinque aliquanto acuminata, valde inæquilateralis, mediocriter compressa, lamellis paucis valde distantibus tenuibus hic illic spinosis instructa, incrementique lineis striata, livido-fuscescens, radiis duobus angustis albis, postice inclinatis, aliis latioribus antice ornata. Margo dorsalis posticus elongatus, late arcuatus, paululum obliquus, anticus longe brevior, valde oblique descendens, levissime concavus. Latus anticum acute rotundatum, posticum inferne productum, magis acuminatum. Margo ventralis late curvatus, postice leviter subsinuatus, intus minute crenulatus. Lunula lanceolata, fuscescens. Dentes cardinales tenues, divergentes. Sinus pallii elongatus, linguæformis. Impressiones musculares parvæ, subpyriformes. Pagina interna fuscopurpurea, versus marginem albida, in medio radio albo bipartita.

The form of this species is irregularly ovate, acuminate at both ends, especially behind. The anterior slope is straightish or a little incurved at the lunule, and much more descending than the hinder dorsal margin. This is broadly curved at first, subsequently descending more abruptly, and with the ventral margin forms a rather acutely rounded angle. The lower edge is widely arcuate in front, but towards the hinder extremity becomes indistinctly sinuated, a feature best seen within the valves. The exterior of the valves is finely striated by the lines of growth, and in addition bears a few very remote concentric ribs. These are thin and curved over towards the umbones, except where they are produced into spine-like prolongations. These are four in number upon each rib, erect, hollow above, and situated one above the other so as to form four radiating series, three of them having a posterior inclination and the fourth near the anterior margin. The beaks are rather small, not quite adjacent, and situated at a point which marks off about three-elevenths of the entire length of the shell from the anterior end. The lunule is narrow, three times as long as wide, of a brown colour, and circumscribed by an impressed stria. The area is somewhat sunken, margined at first by a rounded ridge on each valve which subsequently becomes less apparent. In the right valve the teeth are three in number and rather fine. The hindmost is elongate, diverges from the apex of the umbo, and runs parallel with the ligament. The two others are in the same line with each other, near together, and fall almost perpendicularly from the beak. Parallel with and close to the front margin there is a long narrow groove extending the length of the lunule which receives the acute edge of the opposite valve. Within the hinder margin, beyond the ligament, there is a similar furrow, also for the reception of the sharp margin of the left valve. In this there are two teeth, the anterior slender, the posterior

large and much divided above, almost forming two teeth. The ligament is brownish-yellow, small, not prominent, a little longer than the lunule. The muscular scars are subequal, the front one a trifle the smaller, and the pallial sinus is deep, tongue-like in form, parallel with the ventral margin, and extends half-way across the valve, just reaching the central white ray. The colour of this species may be said to consist of brown and white rays of different widths, the former colour predominating. One of the white rays is especially remarkable, bisecting the valves in two nearly equal portions, and within them is still more conspicuous as it passes through the purple-brown patch which stains the upper part of the interior. The crenulation of the margin is very minute, and extends only along the lower and posterior edges, the two dorsal slopes being quite smooth.

Length 26 mm., height 19½, diameter 11.

Habitat.—Port Jackson, Sydney, 4 to 18 fathoms (Challenger); Broken Bay, New South Wales, on the sandy beach (in the British Museum, collected during the voyage of the "Rattlesnake" in August 1847).

Venus (*Chione*) *ovata*, Pennant.

Venus ovata, Pennant, Brit. Zool., p. 206, pl. lix. fig. 3.
Venus ovata, Forbes and Hanley, Brit. Moll., vol. i. p. 419, pl. xxiv. fig. 2, pl. xxvi. fig. 1, and pl. l. fig. 6 (animal).
Venus ovata, Sowerby, Thesaurus, p. 718, pl. clvii. figs. 99, 100.
Venus ovata, Reeve, Conch. Icon., figs. 137, *a*, *b*.

Habitat.—Station 75, off the Azores, at a depth of 450 fathoms: volcanic mud.

This species ranges from Norway to the Mediterranean.

Venus (*Chione*) *scabra*, Hanley.

Venus scabra, Hanley, Recent Biv. Shells, p. 361, pl. xvi. fig. 24.
Venus scabra, Sowerby, Thes. Conch., p. 718, pl. clvii. figs. 101, 102.
Venus scabra, Reeve, Conch. Icon., figs. 97, *a*, *b*.
Chione scabra, Deshayes, Cat. Conch., p. 130.
Venus (*Chione*) *scabra*, Römer, Mal. Blätt., 1867, vol. xiv. p. 58.

Habitat.—Station 233A, Kobé, Japan, in 8 to 50 fathoms; sand.

This species has also been recorded from the Philippine Islands and Australia.

Venus (*Chione*) *striatissima*, Sowerby.

Venus striatissima, Sowerby, Thes. Conch., vol. ii. p. 718, pl. clvii. figs. 103–105.
Venus striatissima, Reeve, Conch. Icon., fig. 135.
Chione striatissima, Deshayes, Cat. Conchif. Brit. Mus., p. 131.
Chione striatissima, Romer, Mal. Blätt., 1867, vol. xiv. p. 59.

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms; and Station 162, off East Moncœur Island, Bass Strait, at a depth of 38 to 40 fathoms.

Venus (*Chione*) *marica*, Linné.

Venus marica, Linné, Syst. Nat., ed. 12, p. 1130.
Venus marica, Chemnitz, Conch.-Cab., vol. vi. figs. 282–284.
Venus marica, Sowerby, Thes. Conch., vol. ii. pl. clvii. figs. 107–110.
Venus marica, Reeve, Conch. Icon., vol. xiv. fig. 101, *a c*.

Habitat.—Levuka, Fiji Islands, in shallow water (Challenger); Ovalau and Matuku, Fiji, in 12 fathoms (Brit. Mus.); Philippine Islands (Cuming); Réunion (Deshayes); Mauritius (Möbius).

This species is so well known that it is unnecessary to give further references than those above mentioned. It must not, however, be mistaken for *Venus recognita*, which, although very like it at first sight, is perfectly distinct. *Venus marica* is more finely costate, and has not the fine posterior radiating lirae of that species nor the frill-like concentric lamellæ; its internal margin is more coarsely denticulate, and the dorsal area differently sculptured.

Venus (*Chione*) *recognita*, n. sp. (Pl. III. figs. 5–5*c*).

Testa ovato-subtrigona, postice aliquanto angustata, fere æquilateralis, albida, plus minusve fusco vel rufo irregulariter (interdum subradiatim) picta. Valvæ mediocriter convexæ, concentrice liratæ, radiatimque costatæ, granulatæ, liris postice prope aream breviter lamellatis, tenuibus, costis paucis ad latus anticum quam cæteris majoribus, aliisque posterioribus aliquanto tenuioribus. Margo dorsi utrinque valde declivis, leviter convexus, extremitatem posticam versus sæpe levissime sinuatus. Latus anticum late rotundatum, posticum angustatum, subcuneiforme. Margo ventris late arcuatus, postice frequenter indistincte sinuatus. Lunula variabilis, elongato-cordata vel lanceolata, in medio prominens, sulco angusto profunde circumscripta, fusco maculata, radiatimque lirata. Area lanceolata, *haud radiatim lirata*, striis incrementi tenuibus solum sculpta, maculis magnis fuscis plerumque picta. Pagina interna alba, violaceo-fusco irregulariter maculata, margine minute denticulato. Sinus pallii parvus, angustus, brevis. Dens medianus cardinis in valva sinistra et duo posteriores valvæ alterae ad apicem bifidi.

This species is almost equilateral, moderately convex, longer than high, triangularly ovate, broadly roundish in front and somewhat acuminated posteriorly. It is whitish, irregularly stained and spotted with reddish-brown, sometimes in the form of more or less interrupted rays. The sculpture consists of concentric and radiating ridges which are closely packed, and at the points of contact form rounded bead-like granules. A few

of the radiating costæ towards the lunule are thicker than the rest on the central part of the valves, and others just in advance of the dorsal area are much more slender and not granular, being crossed by the concentric liræ which at this particular part rise into very thin, frill-like lamellæ. The dorsal margin descends very obliquely on both sides, is a little arcuate, and near the hinder extremity generally exhibits an indication of a feeble sinuation, which, together with a similar faint incurvation in the lower outline, gives this portion of the shell a somewhat rostrate character. The lunule varies in form, in some examples being lanceolate and in others longish heart-shaped. It is radiately-granulosely ridged, concentrically striated, prominent along the middle, and enclosed by a narrow deep groove. The area is comparatively smooth, without radiating liræ, merely sculptured with very fine striæ of growth, and generally marked with largish brown cross-bars or spots. The interior is white, variously stained with purplish or violet-brown. The hinge is not very strong and narrow. The central tooth in the left valve and the two posterior in the right are grooved or bifid at the top. The anterior scar is subovate, the posterior broader, rounder. The pallial sinus is small, narrow, and sharply rounded at the apex. The margin is very finely crenulated along the lower part, and most minutely on the posterior and anterior slopes, remarkably so at the lunule.

Length 21½ mm., height 16½, diameter 10.

Length 18 mm., height 15½, diameter 10.

Habitat.—Station 212, south of the Philippine Islands, in 10 to 20 fathoms; sand.

This species has a close resemblance to *Venus marica*, Linn., and indeed was confused with it by M. Deshayes when he named the Veneridæ in the National Collection. It is distinguished from that species by its generally narrower posterior end, closer and coarser beaded radiating costæ and concentric ridges, the latter posteriorly forming longer thin erect lamellæ and not short scales as in *Venus marica*. In the latter the dorsal area is sculptured with fine radiating granulose liræ which are wanting in *Venus recognita*, in which species the denticulation of the margin is very much finer than in the Linnean form. *Venus costellifera*, Adams and Reeve, is another closely allied species, but has not the posterior lamellæ of the present one, coarser crenulation on the margin, particularly at the lunule, and is radiately ridged on the dorsal area.

Venus (*Chione*) *lionota*, n. sp. (Pl. III. figs. 7–7*b*).

Testa parva, inæquilateralis, alba, vel dilute rufescens, antice in medio aliquanto acute rotundata, postice inferne subproducta, magis acute curvata, ad marginem inferiorem late arcuata, fortiter cancellata. Lunula magna, distincta, elongato-cordato, liris tenuibus radiantibus circiter sex, incrementi lineis concentricis decussatis instructa. Area insignis, subdiaphana, haud radiatim lirata, terminis obsoletis lirarum concentri-

carum ornata. Umbones prominentes, valde incurvati, paulo ante medium siti. Dentes tres cardinales in utraque valva. Margo interior valvarum minute denticulatus.

The form of this shell is longer than high, and somewhat roundly trigonal. The anterior slope descends more suddenly than the posterior, and is arcuate in the lunular region, forming with the upcurved lower edge a sharply rounded end. The posterior slope is well arched, and rounds into the ventral margin more suddenly but lower down than the anterior. The exterior surface, with the exception of the hinder dorsal area, is strongly cancellated with radiating and concentric ridges, the former being thicker than the latter. There are about twenty of them in the earlier growth of the shell, exclusive of those on the lunule. Of these a few down the posterior side are rather finer and more approximated than the rest, which are broader than the interstices between them. In addition to these twenty, as the ventral margin is approached, other finer intercalary costæ are met with. One of these generally falls in each interstice between the larger ones, and gradually tapering from the edge upwards disappears about the middle of the valve. The concentric ridges are moderately thin behind, thicker and submodulous on crossing the anterior and central radiating costæ, vary from about eight to ten in number in the numerous valves under examination, and are generally fairly equidistant. They are excessively slender at the sides, becoming almost obsolete upon the lunule and the area. The hinge-teeth are three in each valve. In the right the anterior is smallest, and not quite parallel with the lunular margin, the two others being subequal and diverging, the hindermost being somewhat bipartite. In the left valve the hindmost is the smallest, very slender, and bounds the ligament. The central tooth is the largest, bifid, situated just under the apex of the umbo, and inclines posteriorly. The front one is more slender, diverging, and directed anteriorly. The beaks are smooth, glossy, hyaline, well incurved, and have a forward direction. Just within the posterior dorsal margin of the right valve there is a shallow groove for the reception of a corresponding small ridge in the opposite valve. The denticulation of the margin, commencing at the umbo in front, extends all round, except for a short distance along the posterior dorsal edge, and is a trifle finer near the hinder extremity than elsewhere. Pallial sinus short, angular.

Length $4\frac{1}{2}$ mm., height $3\frac{2}{3}$, diameter $2\frac{1}{2}$. A variety from Amboina with more slender radiating costellæ has a length of $3\frac{1}{3}$ mm., is 3 high and $2\frac{1}{4}$ in diameter.

Habitat.—Station 188, south of New Guinea, depth 28 fathoms, green mud; variety, Amboina, 15 to 20 fathoms.

The cancellation of the surface of this minute species is very coarse for the small size of the shell, and much stronger than that which obtains in the earlier stages of growth of some of the well-known larger species from the same and neighbouring seas.

Venus (*Chione*) *infans*, n. sp. (Pl. III. figs. 3–3*b*).

Testa parva, rotunde subtrigonalis, inæquilateralis, tenuiter cancellata, alba, interdum fusco obsolete bi-radiata, antice late arcuata, postice angustior, subproducta. Lunula magna, prominens, fusco tincta, elongato-cordata. Area indistincta aliquando fuscescens. Dentes cardinales tres in utraque valva. Margo valvarum intus denticulatus, postice minutissime.

This shell is somewhat triangular, the angles being rounded, about as high as long, with a cancellated surface. The cancellation consists of strong radiating ridges, of which those upon the lunule and a few near the posterior slope are finer than the rest. These are crossed by regular subequidistant fine concentric lamellæ having a crenulated aspect, and being but little elevated. The lunule is large in proportion to the small size of the shell, somewhat bulging, distinctly defined, and probably in most instances stained with light brown, especially at the front part. The umbones are rather prominent, well incurved and a little anterior in position. The hinge is composed of three teeth in each valve. Of those in the right the anterior is the smallest, the others being subequal and diverging. The central in the left valve is short, stouter than the anterior, located just beneath the umbo, and inclines a trifle towards the hinder end. The anterior tooth is more slender, diverging much towards the front, being subparallel with the margin, the posterior being still thinner. The posterior dorsal margin in the right valve is grooved to receive a prominent ridge in the left. The denticulation of the margin is coarse along the lunule, fine immediately beneath and at the posterior extremity, and again more strongly developed along the ventral portion. The interior of the valves is glossy, and exhibits the pattern of the exterior cancellation, but only indistinct traces of the muscular scars and pallial sinus are discoverable.

Length 4 mm., height $3\frac{3}{4}$, diameter $2\frac{1}{3}$. Another specimen is $3\frac{1}{4}$ mm. long and $2\frac{3}{4}$ high.

Habitat.—Station 187, a little to the west of Cape York, North Australia, at a depth of 6 fathoms. Also Station 188, a little further west, at a depth of 28 fathoms.

Several odd valves of this pretty species were dredged at the above localities, but mostly in a dead chalky condition. In such as are fresh, the colour is more or less transparent white, varied with two light brown rays down the central portion of the valves, the lunule and hinder dorsal slope being sometimes tinged with the same colour. The form of the species is high, and the cancellation of the surface comparatively strong, corresponding in this respect with *Venus stutchburyi* of New Zealand.

Venus (*Chione*) *levukensis*, n. sp. (Pl. III. figs. 6–6*b*).

Testa inæquilateralis, alba, radiatim crassecostata, umbones versus lævigata, inter costas sub-distanter concentrice striata, postice oblique subtruncata, antice angustior,

rotundata. Margo dorsalis anterior valde declivis, leviter arcuatus, posticus minus obliquus, aliquanto curvatus, ventralis late arcuatus. Lunula mediocris, distincta, incrementi lineis fortibus striata, costa radianti, quam cæteris minori, circumdata. Dentes cardinales tres in valva dextra, divergentes; anterior parvus, angustus, antice directus, medianus erectus, crassior, sub apice umbonis situs, posticus maximus, retrorsum inclinatus. Margo valvarum intus minutissime denticulatus.

The length of the shell is a trifle greater than the height. It is white, inequilateral, the anterior end being the shorter and somewhat sharply rounded, the hinder extremity, on the contrary, being obliquely subtruncate, terminating in a rounded angle towards the lower part. The dorsal margin is very oblique in front and only feebly arcuate, posteriorly it is almost horizontal, and likewise but little arched. The ventral outline is broadly curved, ascending rather more anteriorly than at the opposite extremity. The exterior surface of the valves is ornamented with strong radiating ribs, which, attenuating from the margin upwards, become obsolete towards the umbones. They are about eighteen in number, rounded, about as broad as the grooves between them, subequal in thickness with the exception of a slender one enclosing the lunule and three or four on the posterior side, rather finer than the rest. The slender one in front and two or three following ones are somewhat tubercular, being crossed by elevated lines of increase. In the deepish furrows between the costæ there are numerous very fine but somewhat distant slightly raised concentric liræ. The lunule is distinct, elongate heart-shaped, marked with rather strong raised lines of growth and a little prominent down the middle. The beaks are small, not much raised above the hinge-line, incurved and directed towards the front. The cardinal teeth are three in number in the right and probably so in the left. They are separated and divergent. The central one is erect, triangular, and situated perpendicularly beneath the apex of the umbo. The front one is the narrowest, and inclines anteriorly; the posterior is a trifle longer than the central, but scarcely so thick, directed backward, and probably in well-preserved specimens is somewhat bipartite at the top. The crenulation of the margin of the valves extends all round excepting upon that portion occupied by the hinge-ligament. It is excessively fine, particularly upon the lunular and posterior edges. The muscular impressions and the mantle-mark are too indistinct for description.

Length 6 mm., height 5.

Habitat—Off Levuka, Fiji Islands, at a depth of 12 fathoms.

This species has a cardium-like aspect, and is remarkable for the inconspicuous character of the concentric sculpture, the strong radiating ridges, and the deep grooves separating them.

Venus (*Chione*) *ninutanensis*, n. sp. (Pl. III. figs. 4–4*b*).

Testa subquadrata, antice ab apice oblique subtruncata, postice inferne producta et paululum acuminata, valde inæquilateralis, costellis radiantibus tenuibus lirisque concentricis inæqualibus subdistantibus concinne cancellata, sordide albida, versus umbones plus minusve rubescens. Lunula elongato-cordata, bene definita. Area parva, linearis aut nulla. Dentes cardinales in valva dextra tres, quarum postremus paulo maximus, alii duo subparalleli, graciliores. In valva sinistra duo anteriores valde divergentes; anterior elongatus, lamelkeformis, tertius posticus elongatus, gracilis. Impressio muscularis anterior elongata, subpyriformis, quam posteriori paulo minor. Sinus pallii perbrevis. Margo valvarum intus minute crenulatus.

The form of this species is that of an irregular quadrangle, of which the anterior slope, in conjunction with the posterior dorsal margin, forms at the beak one angle which is almost but not quite so acute as a right angle.

The posterior dorsal margin is only slightly oblique and arcuate, curving gently into the lateral margin, which, together with the ventral edge, forms a somewhat sharply curved extremity, rather low down. The anterior slope descends in an abrupt manner, is gently convex, and rounds into the lower margin, rather less acutely than at the hinder extremity. The umbones are fairly prominent, situated very forward, and are well incurved. The lunule is distinctly defined by a deep stria, elongate-cordate in shape, and sculptured with five or six fine radiating costellæ which, being crossed by the lines of growth, become subgranulose. The radiating ridges which ornament the exterior surface are fine, but not crowded, regular towards the umbones, but further down the valves other intercalary ones are met with which are rather finer. A few of the costellæ near the lunule are a trifle stouter and more approximated than the rest. The concentric liræ are thin, crenulated by the radiating riblets, reflexed towards the beaks, especially anteriorly, where they are appressed upon the ribs above. They appear to be comparatively further apart during the earlier stages of growth, and become more numerous and crowded as the shell increases. They differ in thickness, and their number is variable. The hinge is not powerful, and consists of three teeth in each valve. Of those in the right the hindmost is slightly the strongest and subparallel with the ligamental groove, the two others, of which the front one is the more slender, incline the opposite way, and are in a line with each other and almost with the anterior slope. The anterior tooth of the left valve is lamellar, subparallel with the margin, and elongate; the central one located just beneath the beak, is short, thicker, and slopes in the opposite direction, and the hindmost is very slender and borders the ligamental groove. The denticulation of the margin of the valves is very minute, especially posteriorly.

Length 8 mm., height 7, diameter 4.

Habitat. Station 201, off the west coast of the island of Mindanao, Philippine Islands, at a depth of 82 fathoms; stones and gravel.

Venus (*Leukoma*) *australis*, Sowerby.

Venus australis, Sowerby, Proc. Zool. Soc. Lond., 1835, p. 22.
Venus australis, Sowerby, Thesaurus, p. 719, pl. clvii. figs. 111, 112.
Venus australis, Hanley, Recent Shells, p. 118, pl. xv. fig. 18.
Venus australis, Reeve, Conch. Icon., fig. 107, *a*, *b*.
Chione australis, Deshayes, Cat. Conchif. Brit. Mus., p. 112.
Venus (*Chione*) (*Leukoma*) *australis*, Romer, Mal. Blatt. 1867, vol. xiv. p. 102.

Habitat.—Port Jackson, Sydney, in 5 to 7 fathoms (Challenger); Swan River (Deshayes).

Venus (*Chamelæa*) *mesodesma*, Quoy and Gaimard.

Venus mesodesma, Quoy and Gaimard, Voy. "Astrolabe," vol. iii. (1834), p. 532, pl. lxxxiv. figs. 17, 18.
Venus crassa, Quoy and Gaimard, *loc. cit.*, p. 525, pl. lxxxiv. figs. 7, 8.
Venus denticulata, Quoy and Gaimard, *loc. cit.*, p. 530, pl. lxxxiv. figs. 14, 16.
Venus violacea, Quoy and Gaimard, *loc. cit.*, p. 533, pl. lxxxiv. figs. 19, 20.
Venus spissa, Deshayes, Anim. sans Vert., vol. vi. p. 373.
Venus spissa, Hanley, Cat. Biv. Shells, p. 117, Appendix, p. 358, pl. xvi. fig. 44.
Venus spurca, Sowerby, Proc. Zool. Soc. Lond., 1835, p. 23.
Venus spurca, Sowerby, jun., Thesaurus, vol. ii. p. 719, pl. clvi. figs. 92–98.
Venus spurca, Reeve, Conch. Icon., vol. xiv. figs. 90, *a*, *b*.
Chione mesodesma, Hutton, Man. N. Zeal. Moll., p. 148.
Venus (*Chione*, sect. *Chamelæa*) *mesodesma*, Romer, Mal. Blätt., 1867, vol. xiv. p. 113.

Habitat.—D'Urville Island, New Zealand, on the beach; also Station 135E, off Tristan da Cunha, at a depth of 1000 fathoms. Hard ground, shells and gravel.

The localities "Valparaiso and the Philippine Islands," assigned to these species by Sowerby and Reeve, require confirmation. Two specimens from Tristan da Cunha, as might be expected, differ slightly from the usual form of the species. They are of a rather less triangular shape, the posterior side being rather broader than in New Zealand examples, and the umbones are placed a trifle nearer the anterior end than in most specimens. They are whitish, destitute of any brown markings, and in one instance reddish at the umbones. With the exception of these few slight differences I cannot discover any characters which could be regarded of sufficient importance to separate specifically these two shells from this well-known and common New Zealand form. Although far apart, the two localities are almost on the same parallel.

Venus (*Gomphina*) *undulosa*, Lamarck.

Venus undulosa, Lamarck, Anim. sans vert., vol. v. p. 606, ed. 2, vol. vi. p. 370.
Venus undulosa, Philippi, Abbild., vol. i. p. 39, pl. i. fig. 1.
Venus undulosa, Sowerby, Thes. Conch., vol. ii. p. 738, pl. 158, figs. 142–146.
Venus undulosa, Reeve, Conch. Icon., fig. 126, *a*, *b*.
Venus undulosa, Pfeiffer, Conch.-Cab., ed. 2, p. 186, pl. xxiii. fig. 3.
Gomphina undulosa, Morch, Yoldi Cat., p. 19.
Chione undulosa, Deshayes, Cat. Conchif. Brit. Mus., p. 152.
Chione (*Marcia*) *undulosa*, H. and A. Adams, Genera Moll., vol. ii. p. 423.
Venus (*Gomphina*) *undulosa*, Römer, Mal. Blätt., 1865, vol. xii. p. 143.
Tivela undulosa, Angas, Proc. Zool. Soc. Lond., 1867, p. 922.
var.? = *Cytherea* (*Gomphina*) *moerchi*, Angas, Proc. Zool. Soc. Lond., 1872, p. 611, pl. lxii. fig. 7.

Habitat.—Station 187, near Cape York, North Australia, in 6 fathoms; coral mud.

In the British Museum there are specimens of this variable yet easily recognisable species from Swan River collected by Captain Mangles, R.N., and Mr Jukes, and a totally white variety from Sydney.

The shell described by Angas under the name *Cytherea* (*Gomphina*) *moerchi*, from an unknown locality, I believe to be an extreme variation of the present species. The type, presented to the British Museum by the author, appears to me somewhat distorted at the posterior end of the ventral margin, which gives rise to the slight sinuation at that part. The composition of the hinge, the muscular scars, pallial sinus, lunule, and external sculpture are absolutely identical as in *Venus undulosa*. The main distinction is that of form. In typical specimens the umbones are situated somewhat in advance of the centre, the anterior slope being in consequence shorter than the posterior. In the example described by Angas they are as nearly as possible central, and the dorsal margins about equal. The colour of this shell is also rather peculiar, the undulating zigzag painting being pinkish instead of brown, which is the usual tint when present. The wavy lines across the lunule and area are precisely similar as in certain undoubted forms of this species before me. Another indication of its specific identity is the presence of two somewhat interrupted rays which fall exactly in the positions as in many normal examples, namely in a divergent manner from the umbones to the ventral margin. The single Challenger specimen has a peculiar coating or pseudo-epidermis of carbonate of lime of a fibrous nature, the fibres being at right angles to the surface of the shell.

Cytherea, Lamarck.

Cytherea (*Callista*) *chione*, Linné.

Habitat.—Tenerife, Canary Islands, at a depth of 70 fathoms.

This species is so well known that I refrain from giving any references or synonymy.

It has been recorded from the south and west coasts of England, the coasts of France and Portugal, throughout the Mediterranean, and from the Canary Islands. It is also found fossil in the Coralline Crag and in the Tertiary formations of Italy and Sicily.

Cytherea (*Callista*) *rutila*, Sowerby.

Cytherea rutila, Sowerby, Thes. Conch., vol. ii. p. 743, pl. clxiii. fig. 205.
Dione rutila, Reeve, Conch. Icon., fig. 18.
Dione rutila, Deshayes, Cat. Conchif. Brit. Mus., p. 58.

Habitat.—Station 162, off East Monceeur Island, Bass Strait, at a depth of 38 to 40 fathoms; sand and shells.

The following are the measurements in millimetres of three specimens in the Cumingian collection and the single valve (the smallest) from the above locality.

Length.	Height.	Diameter.
53	42	29
36	31	21
23	17	10
$18\frac{2}{3}$	$13\frac{1}{2}$	8

In many respects *Cytherea rutila* resembles *Cytherea diemenensis*, and, indeed, at one time I was inclined to consider them forms of one and the same species, which may yet be shown to be the case. The former, judging from the three large specimens and a fourth in the young state in the Cumingian collection, is not so long as the latter species, smoother, has large blotches on the hinder dorsal slope, and a slightly more elongate lunule, and appears to attain a larger size. The brown rays are frequently interrupted or partially concealed by broad and narrow concentric pale zones. Another distinction is the absence of the purple ray which occurs in *Cytherea diemenensis*. The two young odd valves from Station 162, off East Monceeur Island, and a small specimen in the Cumingian collection, are rather more elongate than the typical form.

Cytherea (*Callista*) *lilacina*, Lamarck.

Cytherea lilacina, Lamarck, Anim. sans vert., ed. 2, vol. vi. p. 303, No. 15.
Cytherea lilacina, Hanley, Rec. Shells, p. 98, pl. xv. fig. 12.
Cytherea lilacina, Sowerby, Thes. Conch., vol. ii. pl. cxxx. fig. 74.
Dione lilacina, Reeve, Conch. Icon., vol. xiv. fig. 5.
Cytherea (*Callista*) *lilacina*, Römer, Monogr. Venus, vol. i. p. 61, pl. xviii. figs. 2 *2b*.
Cytherea pectoralis, ? Lamarck, *loc. cit.*, p. 304.
Cytherea pectoralis, Sowerby, *loc. cit.*, pl. cxxx. fig. 75.
Dione grata, Deshayes, Cat. Conchif. Brit. Mus., p. 62.
Dione grata, Reeve, *loc. cit.*, fig. 11, *a*, *b*.
Cytherea (*Callista*) *grata*, Römer, *loc. cit.*, p. 64, pl. xix. fig. 5.

Habitat.—Station 212, south of the Philippine Islands, in 10 to 20 fathoms; sand.

I cannot discover any sufficient reasons for separating *Cytherea lilacina* and *Cytherea grata*. The differences of form, the thickness of the concentric costæ, and the slight variations in the depth and height of the pallial sinus are so changeable that one scarcely finds any two specimens alike. Two that correspond as regards the strength of the ribs may be unlike in respect of the form of the sinus in the pallial impression, and, on the other hand, I find other examples agreeing in the latter respect but differing in the former. *Cytherea costata*, Chemnitz, is also very closely related, and indeed insensibly passes into this species through the variety fig. 14*b* of the Conchologia Iconica. This is regarded by Römer as a form of Chemnitz's species. In my judgment, however, it comes intermediate, agreeing in the general tone of its colouring with *Cytherea grata*, but being rather more strongly ribbed than the typical form of that species. The amount of violet-red markings around the lunule and on each side of the dorsal area is also subject to much variation. In *Cytherea lilacina* there is either none at all or but very little, whilst in the type of *Cytherea grata* there is considerable; but in the series of specimens before me I find some which have rather less. The lunule also varies in form and colour, in some instances being much broader than in others, although the shells may coincide in other respects.

Cytherea (*Callista*) *multistriata*, Sowerby (Pl. I. figs. 5–5*c*).

Cytherea multistriata, Sowerby, Thes. Conch., vol. ii. p. 628, pl. cxxxvi. fig. 177 (too highly coloured).
Dione multistriata, Deshayes, Cat. Biv. Brit. Mus., p. 64. (var. *β. exclusa*).
Callista multistriata, Hutton, Man. N. Zeal. Moll., pp. 149 and 203.
(*nec Cytherea multistriata*, Römer, Monogr. Venus, sub-gen. Cytherea, p. 72, pl. xxi. fig. 1; *nec Dione multistriata*, Reeve, Conch. Icon., fig. 60 = *Cytherea diemenensis*, Hanley).

Habitat.—Station 167A, Queen Charlotte Sound, Cook Strait, New Zealand, at a depth of 10 fathoms, mud; Wellington (Hutton).

No characteristic figure of this species has yet been published. That in the Thes. Con. is much too highly coloured, and represents a specimen rather unusually high at the umbones, with the dorsal margin more oblique on both sides than in the majority of specimens.

The form is oval, rather acuminate posteriorly. It is moderately convex, a little glossy, finely concentrically striated, the intervening ridges resembling thread-like liræ. It is very inequilateral, half as long again as high, of a buff colour, variegated with interrupted rays and irregular wavy lines of a pinkish-brown tint, and frequently exhibits at intervals two or three bluish concentric zones. The interior is white, with a large purple patch occupying the central and upper portions of the valves. The lanceolate lunule is generally light purple, and marked off by an impressed line.

Cytherea (*Callista*) *disrupta*, Sowerby (Pl. I. figs. 4–4*c*).

Cytherea disrupta, Sowerby, Thes. Conch., vol. ii. p. 743, pl. clxiii. figs. 208, 209.

Testa transversim elongato-ovalis, postice subacuminata, modice convexa, valde inæquilateralis, nitida, concentrice tenuissime striata, incrementique lineis suleiformibus et liriformibus ornata, sub epidermide tenui, alba roseo-fusco copiose subradiata, irregulariterque maculata, in dorsum postice maculis saturatioribus magnis tres vel quatuor irregularibus picta. Margo dorsalis posticus elongatus, aliquanto convexus, oblique descendens, anticus paulo concavus, declivis, multo brevior. Ventris margo inerassatus, late curvatus, antice longe adscendens. Lunula ovato-lanceolata, concava, plerumque alba, linea incisa circumscripta. Umbones mediocres, parum elevati, circiter in $\frac{1}{4}$ longitudinis collocati. Pagina interna alba, umbones versus macula magna livido-purpurea tincta. Cardo dentibus approximatis. Sinus pallii profundus, latiusculus, ad apicem oblique truncatus, angulo terminali acuto.

The form of this species is transversely long oval, rather more acuminate behind than in front. The dorsal margin is elongate, somewhat arched and oblique posteriorly, the anterior portion being less than half the length of the posterior side, more sloping and concave. The lower outline is widely arcuate, and rather more ascending in front than behind. The shell is moderately convex, very inequilateral, finely concentrically striated, and exhibits rather coarse lines and grooves of growth, especially in adult shells, which do not, however, affect the dorsal area. Beneath a very thin epidermis it is whitish, copiously stained and blotched irregularly with a pinkish-brown colour, generally in a more or less subradiating manner, and upon the hinder dorsal area, and in front of the lunule, it is ornamented with a few large darker blotches. The lunule is concave, generally white, or with perhaps one or two small dark brown specks upon it, of an ovate-lanceolate form, and enclosed by a fine impressed line. The umbones are small, a little raised above the hinge-line, rosy at the apices, and situated at a little more than a quarter of the whole length from the front end. The interior is white at the sides and lower margins, which are rather thickened, but from the centre to the beaks is stained with a livid purplish tint, which in full-grown specimens is more or less concealed by callus. The hinge is rather slight and composed of fine approximated teeth. The sinus in the pallial line is wide and rather deep, but not reaching quite to the centre of the valves. It is obliquely broadly truncated at the end, the upper angle being rounded and the lower rather acute.

The dimensions of half-grown specimens are—length 26 mm., height 18, diameter $11\frac{1}{2}$. Adult examples are 41 mm. in length, 32 high, and 21 in diameter.

Habitat.—Port Jackson, New South Wales, in 2 to 10 fathoms.

There are two or three species with which this is likely to be confounded, namely,

Cytherea multistriata, Sowerby, *Cytherea diemenensis*, Hanley, and young specimens of *Cytherea multiradiata*, Sowerby. *Cytherea disrupta* is a more solid shell than *Cytherea multistriata*, not quite so acute posteriorly, with the valves peculiarly thickened at the margins, the dorsal area conspicuously blotched, the lunule for the most part white and concave in the middle, the dorsal line on this side being excavated in consequence. On the other hand, in *Cytherea multistriata*, the lunule is coloured, not sunken in the middle, the dorsal outline straight, the posterior area generally more faintly blotched, and the edge of the valves is acute.

The latter species is also differently striated, the tone of its colour not quite similar, the hinge even slighter, and the beaks not, as a rule, rosy at the tips.

Cytherea diemenensis, Hanley[1] = *Cytherea innocens*, Sowerby = *Cytherea multistriata*, Römer[2] and Reeve[3] (*non* Sowerby) ? = *Cytherea planatella*, Lamarck,[4] is not so oval as the species above described, has the anterior dorsal margin straight and much more descending, and more regular markings, the interior displaying only a single purplish ray directed posteriorly from the umbones.

Cytherea (*Callista*) *roseotincta*, n. sp. (Pl. I. figs. 6–6*b*).

Testa transversim ovalis, valde inæquilateralis, nitida, striis concentricis tenuissimis, antice paulo distinctioribus, sculpta, albida, roseo (marginem versus radiatim) irregulariter tincta, area et lunula maculis paucis parvis notatis. Margo dorsi posticus elongatus, leviter arcuatus, paulo obliquus, anticus declivior, subrectilinearis. Ventris margo late regulariterque arcuatus. Umbones parum elevati, incurvati, apicibus rosaceis, in circiter $\frac{1}{4}$ longitudinis positis. Lunula elongato-cordata, leviter depressa, medio prominens, linea elevata circumdata. Cardo mediocriter fortis, dentibus erectis approximatis. Pagina interna alba, umbones versus pallido-roseo sub-biradiatim suffusa. Cicatrix antica parva, acute ovalis, postica major, rotundata. Sinus pallii profundus, latus, ad apicem oblique truncatus.

This species is only moderately convex, transversely oval, a little narrower in front than behind, very inequilateral, of a whitish colour copiously mottled and stained with light fleshy pink, which towards the margin is of a darker tint and disposed in rays. The dorsal area has a few cross-bars of the same colour, and the lunule is also lineated with it. The valves are glossy and very finely concentrically striated, except at the anterior side, where the striæ are rather deeper and coarser. The hinder dorsal margin is elongate, a little obliquely and slightly curved, the anterior being much shorter, more descending, and almost straight. The lower outline is gently arcuate, and ascends a

[1] *Proc. Zool. Soc. Lond.*, 1844, p. 110.
[2] Monogr. Venus, subgenus Cytherea, p. 72, pl. xxi. fig. 1
[3] Conch. Icon., fig. 60.
[4] Anim. sans Vert., ed. 2, vol. vi. p. 305.

trifle more in front than behind. The beaks are small, a little raised above the hinge-line, incurved, rosy at the tips, and situated at about a quarter of the whole length from the anterior extremity. The teeth are small, erect, and much approximated. The interior is whitish, and exhibits two broad pale rosy red rays towards the upper part. The anterior muscular impression is oval, acute at both ends, the hinder being larger and rounder. The pallial sinus is large, broad, deep, extending to the centre of the valves, obliquely truncated at the end, the upper corner of the truncation being rounded, and the lower one sharply rectangular.

Length 17½ mm., height 13, diameter 8½.

Habitat.—Station 212, south of the Philippine Islands, at a depth of 10 to 20 fathoms; sand.

This species probably attains larger dimensions than those given above. It is distinguishable on account of its fine striation and the peculiar distribution and tone of its colouring.

Cytherea phasianella, Deshayes, approaches it in form, but is a little broader in front and more acuminate posteriorly. *Cytherea roseotincta* is, however, readily distinguished by its finer striæ, different painting, slighter hinge, and larger muscular scar at the hinder end.

Cytherea (*Caryatis*) *rostrata*, Koch.

Cytherea rostrata, Koch, Philippi's Abbild., vol. i. p. 150, pl. i. fig. 3.
Cytherea rostrata, Sowerby, Thes. Conch., vol. ii. p. 633, pl. cxxxiii. fig. 122.
Dione rostrata, Reeve, Conch. Icon., vol. xiv. fig. 11.
Cytherea (*Caryatis*) *rostrata*, Römer, Monog. Venus, vol. i. p. 90, pl. xxiv. figs. 3–3*b*.
Venus tehuelcha, d'Orbigny, Voy. Amér. Mérid., vol. v. p. 556.

Habitat.—Station 321, off Monte Video, in 13 fathoms; mud.

M. d'Orbigny was probably in error in stating that Philippi's locality "Brazil" was not correct for this species. He himself found it at St. Blas on the coast of Patagonia, and now I record it from Uruguay, so there is every reason to conclude that it ranges still further north as far as South Brazil. The pallial sinus is at times shorter and broader than in the specimen figured by Römer, and the form of the shell is higher in proportion to the length. The following measurements of an extreme example will illustrate this.

Length 39 mm., height 37½.

Cytherea (*Caryatis*) *hebræa*. Lamarck.

Cytherea hebræa, Lamarck, Anim. sans vert., vol. v. p. 568, ed. 2, vol. vi. p. 308.
Cytherea hebræa, Delessert, Recueil de Coq., pl. viii. fig. 6.
Cytherea hebræa, Hanley, Cat. Biv., p. 99, suppl. pl. xiii. fig. 21.
Dione hebræa, Deshayes, Cat. Conchif. Brit. Mus., p. 67.
Circe hebræa, Reeve, Conch. Icon., fig. 34.
Venus (*Cytherea*, sect. *Caryatis*) *hebræa*, Römer, Monog. Venus, p. 116.
? *Venus* (*Cytherea*, sect. *Caryatis*) *soligena*, Römer, *loc. cit.*, p. 118, pl. xxxii. fig. 1.
Cytherea sophiæ, Angas, Proc. Zool. Soc. Lond., 1877, p. 176, pl. xxvi. fig. 23.

Habitat.—Station 212, Malanipa, Philippine Islands, 10 to 20 fathoms, sand: Cape Solander, Botany Bay, New South Wales, after a gale (Angas).

This species appears to vary rather as regards shape. The typical form, judging from Delessert's figure, is rather trigonal, acuminately produced at the hinder extremity. Certain specimens in the British Museum are much broader at this part, yet are evidently the same species. The single valve from the Philippines is remarkably short and high, being less elongate even than the shell figured by Reeve. The young example described by Angas under the name *Cytherea sophiæ* is rather more oblong than usual, but in other respects agrees precisely with normal specimens of the species. The small brown stain within the valves at the apex of the umbones is apparently present in the majority of specimens, and forms a good distinguishing feature. When present, it is also visible on the exterior, having the appearance of a livid or purplish stain (in some instances darker than in others), chiefly upon the anterior side of the beaks. The surface is rather glossy, concentrically finely striated, and exhibits at intervals shallow grooves which probably indicate periods of growth. The lunule is large, ovate-cordate, slightly excavated and very feebly elevated along the centre. It is circumscribed by an incised line, and generally painted with wavy brown markings which do not appear ever to cross the incised boundary. The dorsal area is not clearly defined, but merely sunken along the middle, the surface of the valves gradually rounding over to the margin. The umbones are rather prominent, well incurved, and situated at a point which does not mark off one-third of the entire length of the shell from the anterior end. The two cardinal teeth in the right valve, immediately beneath the beak, are very small and very close together. The corresponding ones in the left valve are very unequal in thickness and united above, the anterior being very slender and lamellar, whilst the posterior is triangular and stout. The lateral tooth in this valve is compressed, erect, and stands about a third of the way down the lunule. The anterior muscular scar is nearly oval, the posterior much broader and rounded. The pallial line in the largest specimens has a ragged upper edge, and the sinus is largish, bluntly triangular, the apex being sharply rounded, but does not reach quite to the centre of the valves. The colour of this species is white, ornamented with blotches of an

ochreaceous or brownish-ochre colour, leaving triangular white spots among them. Sometimes the lower portion of the valves have angular zig-zag lines, displaying a somewhat irregular transverse arrangement.

This species was not recognised by Römer at the time he wrote his monograph, but I am inclined to think he may have described it under another name. His *Cytherea soligena* must be very closely allied to, if not identical with, this species. Although no mention is made of a brown stain within the valves at the umbones, in the copy of his monograph before me, figure 1*b* exhibits, in front of the beaks, a purplish blotch as seen in *Cytherea hebraea*, which is indicative of the mark within. Römer's shell is very like the specimen figured by Reeve, but a little higher, and has the same character of markings as the single valve obtained by the Challenger Expedition. *Cytherea pellucida*, Lamarck, approaches very closely to this species, but may be distinguished by the absence of the internal brown blotch, the presence of a dark stain on the lunule, the brown wavy lines upon it at times crossing the incised line which surrounds it, and a more deeply sinuated pallial line, the sinus extending almost if not quite to the centre of the valves. The style of markings and colour is very similar, and the hinge, about the same in composition, is not quite so stout as in *Cytherea hebraea*. Care must also be taken not to confound *Cytherea hebraea* with *Cytherea varians* of Hanley, a species found on the coast of Brazil. This shell is more acuminate in front, more strongly striated, has a brown spot upon the otherwise white lunule immediately under the umbones, a stouter hinge, a different style of painting, and no stain in the interior at the beaks.

Cytherea (*Caryatis*) *coxeni*, Smith (Pl. I. figs. 7–7*c*).

Cytherea (*Caryatis*) *coxeni*, Smith, Report of the "Alert" Mollusca, p. 95, pl. vii. figs. A–A².

Testa parva, inæquilateralis, trigono-ovata, utrinque subacuminata, mediocriter convexa, alba, lineis tenuibus paucis punctisque pallide rufis ornata, striis sulcisque concentricis angustissimis exarata. Margo dorsi utrinque valde declivis, postice arcuatus, antice subrectus, brevior; margo ventralis late curvatus, ad latus anterius oblique ascendens. Umbones parvi, modice acuti, albi, aut dilute rufescentes, incurvati. Lunula elongato-cordata, incrementi lineis striata, vex depressa, in medio paulo elevata, linea impressa succincta. Area nulla. Cardo fortis, dente mediano valvæ sinistræ crasso, laterali magno, elevato, parum compresso. Cicatrix antica ovato-pyriformis, postica rotundior, major. Sinus pallii subquatratus, superne oblique truncatus.

This species is longer than high, ovate-subtrigonal, very inequilateral, moderately convex, white, marked at intervals with narrow subpellucid zones, and ornamented with very fine, somewhat angular lines and dots of a light red or brown colour. This

painting is so faint that, at a short distance from the eye, it is scarcely observable. The valves are moderately strong, and finely, concentrically striate and sulcate. The umbones are smallish, moderately acute, white or pale reddish, curved over towards the front, and situated at about one-fourth of the entire length from the extremity. The lunule is smallish, elongate, heart-shaped, scarcely at all sunken, a little elevated along the central line, circumscribed by an impressed line and striated by the lines of growth. The dorsal margin descends considerably on both sides of the beaks, the anterior portion being almost rectilinear, and the posterior much longer, and regularly, gently arched. The lower outline is broadly arcuate, more ascending in front than behind, forming with the upper margin subequal, sharply rounded, lateral extremities. The hinge is rather strong for so small a shell, having in the left valve a stout triangular central tooth and a largish elevated and somewhat compressed lateral. The front muscular impression is ovate-subpyriform, and smaller than the posterior, which is more rounded. The sinus in the pallial line is moderately deep, wide, and has a squarish aspect as the end is obliquely truncated, the inner angle being acute and almost reaching the centre of the valves.

Length 13 mm., height 10½, diameter 7.

Habitat.—Torres Strait, in 3 to 11 fathoms (Challenger); Port Molle, Queensland, at a depth of 14 fathoms (Dr. Coppinger in Brit. Mus.).

Cytherea minuta, Koch (Philippi's Abbild., vol. i. p. 200, pl. iii. fig. 8), is a more equilateral species than that under consideration, has a larger lunule, and a narrower and somewhat deeper pallial sinus.

The specimens from Torres Strait are almost entirely white, with the exception of the reddish apices of the umbones, but this absence of painting may or may not be usual.

Cytherea (*Caryatis*) *regularis*, n. sp. (Pl. I. figs 8–8*b*).

Testa parva, inæquilateralis, parum inflata, alba, subtenuis, trigono-rotundata, concentrice regulariter ac tenuiter lirata, lunula magna, haud profunda instructa. Umbones prominentes, incurvati, latus anticum versus curvati, concentrice tenuiter striati, aliquanto ante medium siti. Margo dorsalis posticus elongatus, curvatus, obliquus; anticus brevior, minus arcuatus, obliquior; ventralis late rotundatus. Latus anticum latius quam posticum. Pallii sinus triangularis, profundus.

This species is a little longer than high, somewhat inequilateral, and inflated, thinnish, white, subtrigonal, rounded, a little produced and narrower behind than in front, sculptured with regular, fine, concentric narrow grooves and intervening rounded lirae, very slender at first, and increasing in thickness with the growth of the shell. The umbones are well produced and incurving towards the front and situated decidedly in advance of the centre. The lunule is large, cordate, not sunken, and is marked off by

a conspicuous impressed line. The hinder dorsal slope is a little arched, oblique, and longer than the anterior, which is also feebly curved and a trifle more descending. The front lateral margin is regularly well curved: the posterior a little more acutely, which is more marked as the shell increases in size. The lower outline is an even broad curve. Hinge rather similar to that of the European *Circe minima*, but differs in having the hindmost tooth in the right valve, and the central one in the left thicker and bifid. The ligamental groove is elongate and narrow. The muscular scars are large, and the pallial is large, triangular, reaches half across the valves, and terminates in a rounded tip.

Length $8\frac{1}{3}$ mm., height 7, diameter 5; a smaller specimen is $5\frac{1}{2}$ long, 5 high, and 4 in diameter.

A larger valve has come to hand since giving the above dimensions. It is 10 mm. long and 9 high.

Habitat.—Torres Strait, North Australia, at a depth of 3 to 11 fathoms. Also Station 188, west of Cape York, North Australia, in 28 fathoms; mud.

Cytherea (*Dione*) *philippinarum*, Hanley.

Cytherea philippinarum, Hanley, Rec. Biv. Shells, p. 356, pl. xv. fig. 36.
Cytherea philippinarum, Reeve, Conch. Icon., vol. xiv. fig. 47, *a*, *b*.
Cytherea philippinarum, Sowerby, Thes. Conch., vol. ii. p. 627, pl. cxxxvi. fig. 177.
Meretrix philippinarum, Deshayes, Cat. Conchif. Brit. Mus., p. 39.
Cytherea (*Dione*) *philippinarum*, Römer, Monog. Venus, vol. i. p. 139, pl. xxxvii. figs. 2–2*c* (very excellent).
Cytherea mendana, Philippi, Zeitschr. f. Malak., vol. viii., 1851, p. 72.

Habitat.—Levuka, Fiji Islands, at a depth of 12 fathoms; and in Tahiti Harbour in 20 fathoms; also at the Banda Islands, in shallow water.

The only localities from which this pretty species appears to have been hitherto recorded are the Philippine and Marquesas Islands, the former on the authority of Mr. Cuming and the latter on that of Philippi.

Circe, Schumacher.

Circe scripta (Linné).

Venus scripta, Linné, Syst. Nat., ed. 12, p. 1135.
Circe scripta, Sowerby, Thes. Conch., vol. ii. pl. cxxxix. figs. 38–42.
Circe scripta, Reeve, Conch. Icon., fig. 1.
Venus (*Circe*) *scripta*, Römer, Monog. Veneridæ, vol. i. p. 193, pl. lii. fig. 1.

Habitat.—Port Jackson, New South Wales, in 4 to 18 fathoms; and Torres Strait, at a depth of 3 to 11 fathoms.

The painting of this species, although very variable, is constant in the specimens from the above localities in two particulars, namely, in being of a dark brown tint upon the lunule and area, and for the most part uniformly pale upon the flattened umbones. In the young state the shell is remarkably compressed, a specimen 16 mm. in length having a diameter of only $2\frac{1}{2}$. This species ranges from the Red Sea through the Indian Ocean as far as the Moluccas.

Circe sulcata, Gray.

Circe sulcata, Gray, Analyst, vol. viii. p. 307.
Circe sulcata, Römer, Monog. Venus, vol. i. p. 210, pl. lvii. figs. 2–2*g*.
Circe sulcata, Reeve, Conch. Icon., fig. 16, *a–c*.
Circe artemis, Deshayes, Cat. Conchif. Brit. Mus., p. 86.
Circe artemis, Reeve, Conch. Icon., fig. 15.
Circe metcalfei, Deshayes, Proc. Zool. Soc. Lond., 1853, p. 28.
Cytherea erythraea, Jonas, Philippi's Abbild., vol. iii. p. 71, pl. ix. fig. 2.
Circe picta, Römer, Mal. Blätt., 1860, vol. vii. p. 155.
Cytherea plebeia, Hanley, Rec. Biv. Shells, p. 356, pl. xv. fig. 37.

Habitat.—Station 212, south of the Philippines, in 10 to 20 fathoms, on a sandy bottom; also off Levuka, Fiji Islands, in 12 fathoms.

Circe metcalfei, Deshayes, is identical with *Circe artemis* of the same author, and not a variety of *Circe undatina* as suggested by Römer. It is rather more coarsely concentrically ridged than the typical form of this species, bluish-white, varied with very little of the brown painting which usually adorns this species. The specimens from the first locality are half-grown examples of the variety *plebeia*.

Circe australis, Sowerby.

Circe australis, Sowerby, Thes. Conch., vol. ii. p. 651, pl. cxxxvii. figs. 16, 17.
Circe australis, Deshayes, Cat. Brit. Mus., p. 87.
Circe australis, Reeve, Conch. Icon., fig. 19.
Venus (*Cytherea* (*Cristu*)) *australis*, Römer, Monog. Venus, vol. i. p. 186.

Habitat.—Station 188, south of New Guinea, at a depth of 28 fathoms; green mud.

This species is rather more compressed than *Circe dispar*, more finely concentrically ridged, and has very much finer diverging sculpture at the sides. There are specimens in the British Museum from Friday Island, Torres Strait, and North-east Australia.

Circe gibbia (Lamarck).

Cytherea gibbia, Lamarck, Anim. sans vert., vol. v. p. 577.
Cytherea gibbia, Sowerby, Gen. of Shells, fig. 3.
Circe gibbia, Sowerby, Thes. Conch., pl. cxxxvii. figs. 4–7.
Circe gibbia, Reeve, Conch. Icon., fig. 21, *a–d*.
Venus (*Cytherea* (*Crista*)) *gibbia*, Römer, Mal. Blätt., 1863, p. 17.
Venus (*Cytherea* (*Crista*)) *gibbia*, Römer, Monog. Veneridæ, vol. i. p. 176, pl. xlvii. fig. 2.

Habitat.—Station 188, south of New Guinea, in 28 fathoms; green mud.

This species has been recorded from several localities in the Indian Ocean, from the Philippine Islands, and from New Caledonia.

Circe bermudensis, n. sp. (Pl. II. figs. 1–1*b*).

Testa parva, trigono-rotundata, paulo inæquilateralis, albida (?), mediocriter convexa, utrinque rotundata, liris radiantibus et concentricis tenuibus cancellata. Margo dorsi utrinque valde declivis, postice leviter arcuatus, antice rectiusculus, ventralis parum curvatus. Umbones mediocres, aliquanto ante medium siti, acuti, incurvati. Lunula impressa, late lanceolata. Dentes cardinales normales, postico valvæ dextræ et mediano sinistræ maximis. Sinus pallii indistinctus.

This species is longer than high, and becomes proportionately longer as it increases. It is a little inequilateral, the anterior end, as is usually the case in the Veneridæ, being shorter than the posterior. It is beautifully ornamented with fine concentric liræ, which are crossed by others equally slender radiating from the apices, the points of intersection being somewhat granular. It is probably whitish, but I am unable to speak with certainty upon this point, as all the valves before me are more or less worn. It is rather rounded when very young, but becomes more trigonal in older shells, the umbones being more elevated, and thus producing this appearance. The dorsal margin descends considerably on both sides, is rather longer and a trifle arcuate behind, in front being nearly rectilinear. The two ends are subequal, the posterior, if anything, rather narrower than the anterior, the reverse being the case in the earlier stages of growth. The ventral margin ascends more in front than behind, and is not very much curved at the middle. The lunule is broadly lanceolate, faintly sunken, defined, and exhibits lines of growth. The hinge is normal in construction, the hinder tooth in the right valve and the central one in the left being rather larger than the others. The muscular impressions and the pallial line are too distinct for description.

Length 7 mm., height $6\frac{1}{3}$, diameter $4\frac{1}{2}$.

Habitat.—Station 33, off Bermuda, at a depth of 435 fathoms; coral mud.

The cancellated surface, a feature rather uncommon in this genus, will readily distinguish this from other Atlantic forms. Although the above may not be the full dimensions reached by the species, I am of opinion that it does not attain a very much larger size.

Circe jucunda, n. sp. (Pl. II. figs. 3–3*b*).

Testa rotundata, paulo inæquilateralis, latere antico postico angustiori, albida, incrementi lineis tenuibus, marginem inferiorem versus aliquanto, fortioribus, sculpta, costellis numerosis gracilibus radiantibus granulosis utrinque ornata. Umbones parvi, acuti, incurvati. Margo dorsalis antice vix convexus, leviter obliquus, postice minus descendens, rectiusculus, vel levissime convexus. Ventris margo arcuatus, antice sensim adscendens. Lunula mediocriter magna, linea gracillima impressa circumdata, haud ratiatim lirata. Dentes normales ut in *Circe castrense*. Margo dorsi posticus valvæ dextræ conspicue intus sulcatus, sulco elongato, profundo.

The valves here described are possibly only the young stage of the species, but the character of the sculpture is sufficiently peculiar that the adult form would be recognisable without much difficulty. It is a roundish species, a little longer than high, slightly inequilateral, the anterior side as usual being the shorter. It is white, somewhat convex, sculptured with fine striæ or lines of growth, which become rather coarser as the shell enlarges. In addition there are, on each side, numerous very slender radiating liræ which are a trifle arcuate, especially those upon the anterior end, and, being crossed by the concentric striæ, become finely and very prettily granular. The umbones are rather small, acute, curve over towards the anterior end, and are but little elevated above the dorsal line. This is slightly convex, and rather oblique in front, and forms with the slowly ascending basal margin, which is broadly curved, a narrower, more acutely rounded end than at the opposite extremity. The hinder slope is less oblique and nearly rectilinear at first, then rounding into the lateral outline. The lunule is moderately large, scarcely sunken, enclosed by a very fine impressed line, prominent along the middle, broadly lanceolate in form, and sculptured only with the fine lines of increment. The hinge is composed like that of other species of *Circe*. In the left valve the central tooth is thick, triangular, and much stouter than either of the two others. In the right valve it is also triangular and thickish, but not much stouter than the posterior, which is rather longer. The hinder dorsal slope in the latter valve is conspicuously grooved within, the groove being elongate and extending nearly to the extremity. In the left valve there is a corresponding elevated ridge between the extreme outer edge of the slope and the inner margin of the hinge-plate. The ligament would be internal, or scarcely visible from the exterior. The anterior

muscular impression is elongate and a little smaller than the posterior. The pallial sinus has not been recognised.

Length 3 mm., height $2\frac{3}{4}$, diameter $1\frac{1}{2}$.

Habitat.—Station 188, west of Cape York, North Australia, in 28 fathoms, green mud; and off the reefs at Honolulu, Sandwich Islands, in 40 fathoms.

Since writing the above description, based upon two valves from Station 188, three more valves from Honolulu have been forwarded to me which agree in every particular. They are rather larger than the figured valve, being $3\frac{1}{2}$ mm. long and $3\frac{1}{5}$ high. The radiating granular ridges, which in the Cape York specimen extend only a short distance from the sides, are produced almost to a central line down the middle of the valves, where they divaricate. From the general aspect of those specimens I am rather inclined to think that the species will prove permanently small, and possibly not much larger than the above dimensions indicate.

Circe amica, n. sp. (Pl. II. figs. 2 2*c*).

Testa transversa, ovata superne acuminata, paululum inæquilateralis, alba, ad marginem dorsalem utrinque rubro maculata, concentrice subcostata et sulcata, umbones versus lævigata, in sulcis et ad utraque latera radiatim lirata. Margo dorsi utrinque subæqualiter declivis, postice levissime arcuatus, antice aliquanto concavus. Ventris margo late curvatus, acute rotundatim in dorsalem anticam ambiens, cum postico obtuse angulatim junctus. Umbones parvi, acuti, paulo ante medium collocati. Lunula lanceolata, linea incisa circumdata, rubro tincta. Area angusta, subprofunda, marginibus subangulatis, postice rubro maculata. Dens medianus in utraque valva magnus, conicus, anticus valvæ dextræ eodem minor in valva sinistra. Cicatrices subprofundæ, antica parva, elongata, infra dentes laterales sita, postica latior. Sinus pallii mediocriter latus, sed minime profundus.

The shell of this species is a little inequilateral, the anterior side being rather shorter than the posterior. It is entirely white, with the exception of a spear-head-shaped red spot on the front part of the lunule and a smaller spot of the same colour on the hinder part of the posterior dorsal margin. It is considerably longer than high, about equally broad at each end, rather finely radiately lirate down both sides, and concentrically ridged and grooved near the ventral margin, at the beaks and for a short distance beneath them being almost smooth. The ridges are unequal in size, very little elevated, and somewhat granulous at the sides, where they are crossed by the radiating costellæ. The furrows too are shallow and unequal in width, and have a punctate appearance which is caused by the presence of fine radiating liræ interrupted by the concentric ridges. The dorsal margin descends about equally on each side, but whilst

posteriorly it is the slightest excurved, in front it is a trifle concave. The lower outline is broadly arcuate, and forms in front with the dorsal margin a rather sharply rounded extremity, and posteriorly joins the upper margin in an indistinct rounded angle. The umbones are small, acute, very little elevated, and placed a little in front of the centre. The central cardinal tooth in each valve is triangular and large, the anterior in the right is smaller than that of the left, the posterior in the latter is more slender than the corresponding tooth in the former, and the lateral tooth in the left valve is conical, elongate, and compressed. The muscular scars are rather deep and high up, the anterior, which is elongate, commencing immediately beneath the lateral tooth. The posterior scar is broader, and the pallial sinuation is moderately wide but very shallow. The margin of the valves is flattened within, except along the hinder dorsal slope and the lunule, where it is linearly grooved. The lunule is lanceolate, circumscribed by a distinct impressed line, not affected by the radiating sculpture, but merely striated by fine lines of growth, as is also the case with the narrow posterior area, which is limited by roundly keeled margins. The ligament is small and subinternal.

Length $8\frac{2}{3}$ mm., height $7\frac{1}{3}$, diameter 4.

Habitat.—Station 172, off Nukalofa, Tongatabu, in 18 fathoms; coral mud.

Circe fastigiata (Sowerby).

Cytherea fastigiata, Sowerby, Thesaurus, vol. ii. p. 643, pl. cxxxv. figs. 158, 159.
Circe fastigiata, Reeve, Conch. Icon., vol. xiv. fig. 41.

Habitat.—Cape York, North Australia, in 3 to 12 fathoms.

A single small valve only was obtained at this locality. It agrees with *Circe fastigiata* of Sowerby, which in my judgment is probably only a peculiarly painted variety of the well-known *Circe picta* of Lamarck, and I am of opinion that when our series of specimens from numerous localities has become considerably larger than at present, there will be great difficulty in separating these two forms, in addition to *Circe tigrina*, Lamarck, *Circe trimaculata*, Lamarck, *Circe sulcatina*, Lamarck, and *Circe hieroglyphica*, Conrad.

The shell depicted by Römer (Monog. Venus, vol. i. pl. xlv. figs. 1–1*c*) as *Circe fastigiata* is not Sowerby's species, but rather a form of *Circe tigrina*.

Circe gordoni, n. sp. (Pl. II. figs. 5–5*c*).

Testa subtrigona, valde inæquilateralis, nitida, antice brevis, rotundata, postice angustata, producta, subrostrata, mediocriter inflata, omnino alba, vel lineis rufis transversis angulato-undulatis picta, liris concentricis, umbones lateraque versus perspicuis,

in medio valvarum subobsoletis instructa; margo dorsi anticus brevis, obliquus, vix arcuatus, posticus longior, superne aliquanto curvatus, longe descendens. Margo ventris late arcuatus, postice indistincte subsinuatus. Umbones prominentes, bene incurvati, apice rufescente. Lunula parva, late cordiformis, linea elevata rufo picta circumscripta. Dentes fere ut in *Circe picta*. Pagina interna plus minusve fusco tincta. Cicatrices parvæ, antica elongata, subovata, postica rotundata. Sinus pallii brevis, minime profundus.

This species is moderately inflated, very inequilateral, entirely white or ornamented with a few transverse zig-zag brown lines. It is somewhat trigonal in form, much broader in front than behind, where it is somewhat rostrate. The surface is glossy, regularly concentrically finely sulcate upon the beaks, and more coarsely at the sides, the grooves upon the central portion of the valves becoming more or less obsolete. The ridges are broader than the sulci which separate them, and rounded, especially those upon the beaks, which gradually increase in thickness from the apex. The umbones are considerably elevated, well curved over towards the anterior end, and terminate in a brown or reddish apex. The dorsal line is straightish in front, oblique, a little arched at first behind the umbones, then more rectilinear, prolonged, and much descending. The lower margin is broadly curved, indistinctly subsinuated towards the posterior end, more arcuate and upcurving in front. The lunule is small, broadly cordate, and enclosed with a fine elevated line which is bordered on the outside with a few short, reddish lines. The hinge is very similar to that of *Circe picta*. The interior is sometimes almost entirely white, but in other specimens is more or less stained with brown. When present this colour occurs chiefly about the middle of the valves below the umbones or down the posterior side, but never in front, judging from the four specimens under examination. The muscular impressions are small, the anterior one being elongate and oval, and the hinder one broader and subpyriform. The sinus in the pallial line is small and very shallow.

Length $15\frac{1}{2}$ mm., height $13\frac{3}{4}$, diameter 10.

Habitat.—Off Levuka, Fiji, in shallow water, and 12 fathoms.

On comparing young specimens of *Circe picta*, and one or two allied forms, it will be found that they are very different in form from the present species. They are much more regularly oval, and about as broad behind as in front, whilst in *Circe gordoni* the posterior end is conspicuously narrowed. The umbones too in the latter are more elevated, the concentric sculpture upon them decidedly stronger, and the lunule is much shorter and broader. In *Circe picta* it is generally stained with blackish-brown in front of the beaks, but in the species under consideration it is probably always white.

Circe minima (Montagu).

Venus minima, Montagu, Test. Brit., p. 121, pl. iii. fig. 3.
Circe minima, Forbes and Hanley, Brit. Moll., vol. i. p. 146, pl. xxvi. figs. 4, 5, 6, 8, and Pl. M fig. 3.
Circe minima, Jeffreys, Brit. Conch., vol. ii. p. 322, vol. v. p. 183, pl. xxxvii. fig. 6.
Circe minima, Römer, Monog. Venus, vol. i. p. 214, pl. lviii. fig. 1.

Habitat.—Tenerife, Canary Islands, 70 fathoms; also Station 75, off Fayal, Azores, in 450 fathoms.

To give the complete synonymy and references for this species would probably occupy a whole page or more. It is sufficient to say that I concur in the view taken by Jeffreys, Hanley, and others, that the Mediterranean form, *Circe cyrilli*, should not be held specifically distinct. The species is variable in form and sculpture, as demonstrated by any considerable series from any one locality.

Circe angasi,[1] n. sp. (Pl. II. figs. 4–4*c*).

Gouldia australis, Angas, Proc. Zool. Soc. Lond., 1865, p. 459; 1867, p. 928.
Circe australis, Smith, Proc. Zool. Soc. Lond., 1881, p. 491.

Habitat.—Port Jackson, New South Wales, at a depth of 2 to 10 fathoms.

This species is apparently always small, rather trigonal, convex, inequilateral, thin, glossy, of a pinkish-red tint, whitish towards the umbones, which are tipped with a deeper red, also ornamented with concentric white lines and narrow zones, and frequently exhibiting two pale rays, more distinctly seen within the shell, one towards each end of the valves. The lunule and the upper part of the dorsal area are also stained with the same deep colour as the beaks. The sculpture consists of moderately coarse lines of growth, the striæ towards the anterior end being deeper, and the intervening sublirae coarser than at the opposite extremity. The umbones are prominent, moderately acute, a little incurved, and placed well forward at about one-fourth of the length from the extremity. The hinder end is more prolonged than the anterior and more sharply rounded. The ventral margin is broadly arcuate, the posterior dorsal oblique, straightish, the anterior being a little concave and suddenly descending. The lunule is elongate heart-shaped, very slightly depressed, and clearly defined. Of the three cardinal teeth in the right valve, the front one is lamellar, the central stouter, somewhat triangular, and the hinder one large, elongate, oblique, and bifid. In the left valve the latter is elongate and very slender, the middle one stout, broadest at the base, and joined above to the front tooth, which is only half as thick and divergent. The lateral tooth in this valve is conspicuously large and very near to the cardinal. The pallial line is remarkably remote from the ventral margin, with hardly any indication of a posterior sinus.

Length 6 mm., height 5, diameter $3\frac{1}{2}$.

[1] The name *australis* having been already used may be changed to *angasi* as above.

Circe obliquissima, n. sp. (Pl. II. figs. 6–6*b*).

Testa parva, valde obliqua, subpyriformis, inæquilateralis, antice producta, sublunulata, crassiuscula, albida, subdiaphana, concentrice fortiter costata et sulcata. Umbones prominentes, subacuti. Cardo crassus. Dentes in valva dextra tres; duo postici subæquales, anticus subobsoletus. Sulcus lateralis anticus latus, profundus. Ligamentum internum, elongatum, pone dentem postremum situm.

This shell is remarkably oblique, very inequilateral, the anterior end being much greater than the posterior. It is produced in front, pyriform, very strongly concentrically grooved and ridged, the ridges being continued to the margins. In front they are not interrupted by a decided groove, but merely crossed by a slight depression marking off an ill-defined lunule. The sulci are unequal, every alternate or third one being deeper and broader than those intervening. The colour is white, the texture subdiaphanous, and the surface somewhat glossy. The beaks are rather prominent, moderately acute, and directed somewhat towards the front. The hinge is strong for so small a shell, and consists of three cardinal teeth in the right valve. Of these the central is the largest and parallel with the hinder one, which forms the inner boundary of the ligamental pit. The front tooth in the single valve under examination is subobsolete, and forms as it were the upper extremity of the inner raised edge of the lateral dental groove. The ligament is oblique, parallel with and located within the posterior dorsal margin. The interior is glossy, and, owing to the transparency of the shell, exhibits the concentric sculpture of the exterior. The muscular scars and impression of the mantle are too indistinct for description.

Length 4 mm., height $3\frac{1}{2}$, diameter about 2.

Habitat.—Station 186, off Wednesday Island, North Australia, at a depth of 8 fathoms; coral sand.

This remarkable little shell is peculiar on account of the obliquity of its growth, and the strong character of the concentric sculpture. It is quite unlike any other species of the genus.

Subfamily Dosiniæ.

Dosinia, Scopoli.

Dosinia deshayesii, A. Adams (Pl. I. figs. 1–1*c*).

Dosinia deshayesii, A. Adams, Proc. Zool. Soc. Lond., 1855, p. 223.
Dosinia deshayesii, Römer, Monog. Dosinia, p. 55.

Habitat.—Station 187, near Cape York, North Australia, at a depth of 6 fathoms (Challenger); North Australia (Mus. Cuming); Prince of Wales Channel, Torres Strait, in 5 to 7 fathoms (Dr. Coppinger of H.M.S. "Alert").

This species is rather more ventricose than *Dosinia scalaris* of Menke, in this respect agreeing better with *Dosinia juvenis*, Chemnitz. The concentric ridges are thickened, with acute edges, upon the central portion of the valves, and separated by deeper sulci than in the two above mentioned species. At the sides, as in this form, they are lamellar and more erect. The broad streak in the interior of the valves, radiating from behind the umbones, is not purple, but dark olive-brown, and is not present in all examples. In some specimens of *Dosinia juvenis* a similar style of painting is met with.

With regard to form, this species approaches nearer to *Dosinia scalaris* than *Dosinia juvenis*, which is higher in proportion to the length, and does not, so far as I am aware, attain such large dimensions as *Dosinia deshayesii*, which are as follows :—length 50 mm., height 45, diameter 26. The area is deeper than in *Dosinia scalaris*, and defined by angular edges, particularly noticeable in the left valve, resembling *Dosinia juvenis*. On the contrary, the pallial line is nearer the margin in this species and *Dosinia scalaris* than in *Dosinia juvenis*.

Adams describes the colour as "rufescente, albo variegata." This description does not give a sufficient idea of the painting of this shell, which may be said to be reddish-brown varied with four more or less distinct white rays, one down the posterior dorsal slope, one bordering the lunular margin, and the two others upon the centre of the valves. These rays in some specimens are almost obliterated or confused with the ground colour of the shell, and at the two ends of the valves there are frequently more or less angular markings and oblique lines upon the pale rays. The lunule is particularly wide, certainly wider than in *Dosinia scalaris*, if not deeper. In conclusion, I may observe that all these three species are very closely related, and by some might be regarded as variations of one and the same species, but if *Dosinia scalaris* be retained distinct from *Dosinia juvenis*, we must then admit the validity of the present form.

Dosinia circinaria, Deshayes (Pl. 1. figs. 2–2*c*).

Dosinia circinaria, Deshayes, Cat. Conchif. Brit. Mus., p. 9.
Dosinia circinaria, Römer, Monog. Dosinia, p. 19.

Habitat.—Port Jackson, New South Wales, in 6 to 7 fathoms.

The locality of this species has not hitherto been known. The tip of the umbones appears to be generally stained with a pale brownish colour, a feature not referred to by Deshayes, who also does not give any dimensions. The type which is now figured is 28 mm. long, 27 high, and 16 in diameter.

Dosinia lambata (Gould).

Arthemis lambata, Gould, Wilkes' Explor. Exped., vol. xii. p. 422, figs. 536–536*a*; Otia Conchol., p. 84.
Artemis lambata, Hutton, Manual N. Zeal. Moll., p. 150.

Testa subcircularis, superne producta, mediocriter tenuis, nitida, alba vel lutescens, inæquilateralis, tenuissime concentrice striata, interstitiis ad latera quam in medio magis elevatis, radiatim microscopice striata. Lunula parva, depressa, in medio paulo prominens, acute cordata. Area postica inconspicua, angusta, haud profunda, marginibus rotundatis limitata. Umbones prominentes, aliquanto incurvati, circiter in $\frac{2}{7}$ longitudinis locati. Margo dorsi anticus valde descendens, excavatus, lunula indentatus, posticus minus descendens, leviter arcuatus. Cardo mediocriter levis, dente postico valvæ dextræ elongato, gracili, ad apicem fisso. Sinus pallii elongatus, adscendens, vix ultra medium valvarum productus, ad apicem obtusus.

This species is as high as long, rather circular, produced above at the beaks, moderately convex, inequilateral, glossy, dirty white, creamy white or pale yellowish-brown, marked with excessively fine concentric striæ, near the umbones scarcely visible to the naked eye, all of which do not reach the dorsal margin, so that the interstices at the sides (especially posteriorly) are broader, more elevated, and conspicuous than those on the central portion of the valves. These are rather thin, and sculptured by numerous faintly impressed radiating lines or substriæ and also by countless other striæ which cannot be seen except with the aid of a microscope. The umbones are somewhat produced, acute, curved over a little at the apex and located far towards the anterior end. The ventral outline is semicircularly arcuate, joins the hinder dorsal slope in a very faint rounded angle, and runs into the anterior or lunular margin in a sharpish curve. The posterior dorsal margin is a little convex, somewhat oblique, and much longer than the anterior side, which descends rather abruptly and is concave, indented or irregular on account of the lunule. The hinge-plate is not very thick, having the posterior tooth in the right valve elongate, thin and grooved at the top, the central one in the left in young shells deeply cleft, and the anterior lateral tooth very small, or almost obsolete. The anterior scar is long and narrow, the posterior rather broader. The pallial sinus is deep, narrowly triangular, subacute at the apex and produced upwards a little beyond the centre of the valves. The ligament is visible externally, but a little sunken below the dorsal line. The lunule is very small, elongate heart-shaped, sunken at the sides, and elevated along the central line.

Length 37 mm., height 36, diameter 20.

Habitat.—Station 167A, Queen Charlotte Sound, Cook Strait, New Zealand, in 10 fathoms, mud. "North Island only" (Hutton).

This species is remarkable for the excessive fineness of the concentric sculpture and

the two kinds of radiating striæ, the one visible in certain positions to the naked eye, the other microscopic. I know of but one or two other species so finely sculptured.

Dosinia anus, Philippi, and *Dosinia subrosea*, Gray, both likewise from New Zealand, are more strongly lirate, the former being the most coarsely sculptured of all. In *Dosinia anus* the pallial sinus points below or at the lower end of the anterior scar, in *Dosinia subrosea* at the middle of the scar, and in *Dosinia lambata* it is directed still more upward. The great difference in the sculpture at once distinguishes Philippi's species from the present, and *Dosinia subrosea*, besides being rather more strongly lirate, is different in form. It is a broader shell with the beaks less prominent above, and has a more distinct posterior dorsal angle. All three species have a microscopic radiating sculpture, but that of *Dosinia lambata* is the finest.

Dosinia histrio (Gmelin), var.

Dosinia histrio (Gmelin), Römer, Monog. Dosinia, p. 33, pl. vi. figs. 2, 3.

Habitat.—Station 187, near Cape York, in 6 fathoms; also Flinders Passage, in 7 fathoms; and at Station 189, Arafura Sea, in 25 to 29 fathoms.

The specimens from the first of the above localities are entirely white, and very closely and delicately concentrically lirate. They are perhaps a trifle higher in proportion to the length than is usual. The following are the measurements of two specimens.

Length 33½ mm., height 33½, diameter 19.

Length 30 mm., height 30, diameter 18.

This species has received several names from various authors. It is the *Venus australis* of Quoy and Gaimard, the *Artemis variegata* of Reeve, *Artemis lirata* and *lenticularis* of Sowerby, and perhaps the *Artemis scabra* of Philippi.

The specimens from Station 187 and Flinders Passage resemble the variety *Artemis lirata*.

Dosinia mira, n. sp. (Pl. I. figs. 3–3*c*).

Testa alba, cretacea, tenuis, parum inæquilateralis, transversim rotunde ovata, mediocriter convexa, concentrice dense lirata et lamellata, lamellis tenuissimis, angustis, irregulariter plus minusve interruptis vel abruptis, interstitiis radiatim substriatis. Lunula cordata, modice profunda, in medio prominens, tenuiter lamellato-lirata. Umbones valde incurvati, mediocriter prominentes, paulo ante medium siti, apicibis nitidis, striatis. Margo dorsi anterior valde obliquus, vix curvatus, posticus rectiusculus, minus descendens. Ventris margo late regulariterque rotundatus. Area dorsalis inconspicua, angusta, haud excavata, in medio prominens, utrinque sulco haud profundo, inconspicuo

marginata. Cardo levis, angustus, dentibus tenuibus munitus. Ligamentum angustum, elongatum, conditum, omnino internum. Pallii sinus angularis, apice truncato, usque ad medium valvæ prolongatus. Cicatrix antica elongata, angusta, postica paulo latior, superne lobata.

The shell of this pretty species is rather thin, longer than high, transversely roundish ovate and a little inequilateral, the anterior side being the shorter. It is dull chalky white, very finely and closely concentrically lirate, and lamellated and radiately sculptured in the interstices with minute and very close substriæ. The lamellæ are excessively thin, fragile, not much elevated, and more or less broken in many places, giving the surface a very ornamental appearance. Upon the most convex portion of the valves, and towards the umbones, they are for the most part worn down, and there take the form of fine lirae. The lunule is moderately deeply sunken, cordiform, with straightish sides, elevated along the middle, and sculptured with fine lamellæ of growth. The posterior area is not very apparent, narrow, raised along the dorsal margin and defined by an indistinct shallow depression on each side. The umbones are moderately elevated above the hinge-plate, well curved over towards the front, glossy and finely concentrically striated at the apex. The outline of the valves is regularly curved all round except upon the dorsal margins, which are somewhat straight, the anterior being rather more oblique than the posterior. The ligament is altogether internal, narrow, and long. All the teeth are slender, the central one in the left valve being remarkable in this respect and widely divergent from the thin, erect, anterior tooth. The pallial sinus is deep, extending obliquely upwards a little beyond the middle of the valve; its sides are straight, converging, and the apex is truncated. The front muscular scar is long and narrow, the posterior a little broader, having a little lobe at the upper end.

Length 33 mm., height 28½, diameter 17.

Habitat.—Station 189, south-west of New Guinea, in 25 fathoms; green mud.

Dosinia sculpta (Hanley).

Artemis sculpta, Hanley, Cat. Rec. Biv. Shells, Append., p. 357, pl. xv. fig. 42
Artemis sculpta, Sowerby, Thes. Conch., vol. ii. p. 659, pl. cxli. fig. 15.
Artemis sculpta, Reeve, Conch. Icon., vol. vi. fig. 52.
Dosinia sculpta, Römer, Monog. Dosinia, p. 38.

Habitat.—Torres Strait, in 3 to 11 fathoms.

Only a left valve of a young specimen was collected at the above place. At this age the apex of the umbones is tinted with pale rose, which generally appears to fade away as the shell arrives at maturity. There are specimens in the British Museum said to have been obtained at Moreton Bay, Queensland, by Mr. Strange.

Clementia, Gray.

Clementia papyracea (Gray).

Venus (?) papyracea, Gray, Ann. Philosoph., 1825, vol. ix. p. 137.
Venus papyracea, Wood, Index Test. Suppl., p. 5, pl. ii. fig. 8.
Clementia (gen.) Gray, Synopsis Contents Brit. Mus., 1840, p. 149, and 1841, p. 127.
Clementia papyracea, Gray, Proc. Zool. Soc. Lond., 1847, p. 184.
Clementia papyracea, Sowerby, Thes. Conch., vol. ii. p. 700, pl. cli. fig. 155.
Clementia papyracea, H. and A. Adams, Genera Rec. Moll., vol. ii. p. 433, vol. iii. pl. cix. fig. 1.
Clementia papyracea, Chenu, Manuel de Conch., vol. ii. fig. 410.
Clementia papyracea, Pfeiffer, Monog. Veneridæ, in Conch.-Cab., ed. 2, p. 254, pl. xxxi. fig. 16.
Clementia papyracea, Kobelt, Illust. Conchyl., pl. xcvii. fig. 14.
Artemis (*Clementia*) *papyracea*, Woodward, Man. Moll., p. 306.
Venus hyalina, Philippi, Abbild. und Beschr., Bd. iii. p. 83, pl. x. fig. 6.
Clementia hyalina, Pfeiffer, *loc. cit. supra*, p. 253, pl. xxxi. figs. 9–13.
Clementia cumingii, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 346.
Clementia moretoniensis, Deshayes, *loc. cit.*, 1853, p. 18.
Clementia strangei, Deshayes, *loc. cit.*, 1853, p. 17.
Clementia subquadrata, A. Adams, MS. in Mus. Cuming.
Var. juv. = *Clementia similis*, Sowerby, Thes. Conch., vol. ii. p. 700, pl. cli. fig. 156.

Habitat.—Torres Strait, in 3 to 11 fathoms (Challenger); Cape York (J. B. Jukes, in Brit. Mus.); Moreton Bay, Philippine Islands, and Malacca (Mus. Cuming); Japan (A. Adams and Dunker).

After a careful study of the forms above enumerated I can arrive at no other conclusion than that they all belong to one and the same species. *Clementia strangei* is perhaps the most peculiar among them on account of the regularity and unusual development of the concentric ridges. On the contrary, *Clementia moretoniensis* is remarkable in having mere indications of such ridges, being merely roughly concentrically striated and here and there somewhat plicate. The form is apparently very variable, judging from the series of specimens in the British Museum, no two specimens being absolutely alike in this respect. On the other hand, the hinge appears to be very constant in character, and the pallial sinus and muscular scars are not subject to any important variation.

It is very probable that the shell described and figured by Chemnitz (Conch.-Cab., vol. xi. p. 219, pl. cc. figs. 1959, 1960) as *Mactra vitrea* is the same species as that under consideration. The fact of it belonging to the genus *Clementia* has already been referred to by Philippi, Deshayes, and Pfeiffer.

Family Isocardiidæ (?).

Callocardia, A. Adams.

Callocardia (?) *adamsii*, n. sp. (Pl. VI. figs. 7–7*b*).

Testa valde inæquilateralis, cordata, ventricosa, alba, concentrice tenuiter lirata. Umbones prominentes, magni, incurvati, haud approximati, longe ante medium collocati. Margo dorsi posticus elongatus, declivis, leviter arcuatus, anticus brevior, paulo convexus. Lunula magna, late cordata, infra umbones leviter depressa, in medio aliquanto prominens, linea profunde incisa circumdata. Area postica lanceolata, incrementi lineis striata, subconcava, bene definita. Dentes cardinales valvæ sinistræ duo irregulares, antico elongato sinuoso, infra umbones sito, postico minore obliquo. Valva dextra dente unico elongato irregulari munita. Ligamentum parvum profunde inter umbones supra marginem situm.

This species is somewhat cordate, a little longer than high, very inequilateral, more elongated and produced behind than in front. It is rather convex, moderately thick, white, not glossy, and sculptured with close fine concentric thread-like liræ, which become mere striæ upon the lunule and the posterior dorsal area. The front dorsal margin is a little excurved and rather abruptly descending, the posterior being longer, gently arcuate, and obliquely inclined, forming together with the upcurved ventral outline a rather more acute extremity than in front. The lunule is broadly cordate, a little concave immediately beneath the beaks, a trifle elevated along the centre, and circumscribed by a deeply incised line. The posterior dorsal area is narrow, lanceolate, and defined by subcarinate ridges extending from the beaks to the hinder extremity. The umbones are much elevated above the hinge-line, and curve over considerably towards the front. They are not quite adjacent, and terminate in minute smooth glossy apices which curve away some distance from the centre of the lunule. The hinge-teeth are peculiarly irregular in form, and not easily described. In the left valve there are two, of which the posterior one is narrow, oblique, small, and located below the ligament. The anterior forms an inner raised irregular sinuated and notched edge to the hinge-plate, being separated from the upper hinge-margin by a deep irregular groove. The right valve has but a single elongate tooth of a similar irregular conformation as the anterior in the opposing valve. The ligament is yellowish-brown, rather small, short, and situated deeply between the umbones. The interior of the valves is opaque white in parts, and bluish-white elsewhere, and exhibits numerous largish shallow pits or punctures irregularly disposed. The muscular scars and the pallial line are rather indistinct.

Length $12\frac{2}{3}$ mm., height $11\frac{1}{2}$, diameter 9.

Habitat.—Station 348, south of Sierra Leone, at a depth of 2450 fathoms.

It is doubtful whether this species really belongs to the genus *Callocardia*. It agrees with it in its cordate form, the curved over beaks, and the impressed line

circumscribing the lunule. However, the dentition is not absolutely identical, although after the same type.

In *Callocardia guttata*,[1] dredged off the island of Quelpaart, south of the Korea, in 48 fathoms, the only species as yet described, and of which but a single left valve exists, there are two cardinal teeth, of which the posterior is long, lamellar, slightly arcuate, parallel with the dorsal line, and having the edge produced into two denticles. The anterior tooth is very complicated, being thin, prominent, angularly bent in the middle, with the margin produced into four unequal cusps. The ligament is rather long, and situated in a narrow deep groove upon the margin, so that if the valves were closed but very little of it would be visible.

It will thus be seen that the present species differs somewhat from *Callocardia* in dentition, in its coarser sculpture, and its more external ligament. It might perhaps with the same propriety be considered a large form of *Kelliella*, agreeing equally well with that genus in dentition, form, and lunule.

The two following species bear a still closer resemblance to *Kelliella* both in size and sculpture, so that it becomes questionable whether there be sufficient grounds for separating that genus from *Callocardia*.

Callocardia (*?*) *pacifica*, n. sp. (Pl. VI. figs. 9–9*b*).

Testa parva, globosa, tenuis, fragilissima, alba, hic illic zonis angustis pellucidis, haud conspicuis ornata, concentrice regulariter tenuiterque striata, inæquilateralis, transversim ovato-rotundata. Margo dorsi posticus subhorizontalis, aliquanto arcuatus, anticus brevior, magis obliquus, subrectus. Latera rotundata, anteriori angustiori. Umbones prominentes, valde incurvati, haud contingentes, partem anticam versus conspicue versi, ad apicem opaco-album obtusi. Lunula magna, haud impressa, stria tenui circumscripta, cordata, lateribus valde convexis. Cardo ex dente unico obliquo lamellari in valva sinistra pone umbonem sito, sulcoque elongato antice irregulari profundo compositus.

The shell is longer than high, excessively thin and fragile, oblong rounded, a little narrower in front than behind, and consequently more acutely curved. It is prettily ornamented with milky white and pellucid zones, and sculptured with fine concentric striæ. It is inequilateral, the anterior side being much shorter than the posterior, considerably inflated, and glossy. The umbones are large and prominent, not contiguous, and much curved over towards the lunule. The latter is large, not at all sunken, heart-shaped, the outline, defined by a very fine stria, being much excurved. The dorsal margin is long behind, moderately arcuate and but very slightly oblique; in front it is shorter, less

[1] A. Adams, *Ann. and Mag. Nat. Hist.*, 1864, vol. xiii. p. 307.

curved, and decidedly more descending. There is in the left valve a single oblique lamellar tooth which is situated behind the umbo forming the posterior boundary to a narrow deep groove which is as it were lobed in front and extends a little beyond the apex of the beak. The muscular scars and pallial impression are very indistinct.

Length 4½ mm., height 4, diameter 3.

Habitat.—Station 244, Mid North Pacific Ocean, at a depth of 2900 fathoms; red clay.

A single specimen from the above great depth (nearly three and a third miles) was dredged up perfect, both as regards the shell and animal. In endeavouring to open the valves in order to determine the genus some slight damage was done, and it became necessary to boil the specimen so that the adductor muscles should relinquish their hold and allow the valves to separate. Unfortunately, the hinge-plate of the right valve was destroyed, but, judging from the left valve, its construction must have been all but identical with that obtaining in the following species.

Callocardia (?) *atlantica*, n. sp. (Pl. VI. figs. 8–8*b*).

Testa *Callocardiæ pacificæ* similis, sed brevior, æque longa ac alta.

Beyond the difference in form there is very little to distinguish this species from *Callocardia pacifica*. It is a very remarkable fact that shells so similar should exist at such great depths, at such remote localities, which, however, are situated almost upon the same parallels.

On placing side by side specimens of *Kelliella miliaris* from Hardanger Fiord, Norway, kindly furnished me by the Rev. A. M. Norman, with the Challenger examples of this species, and others from Davis Strait obtained by the "Valorous" expedition, and regarded by Dr. Gwyn Jeffreys as the fry of *Isocardia cor*, I observe certain distinctions. In the first place, I have never seen or heard of a *Kelliella* from Norway attaining to the size (4 mm.) of the specimen from Station 73. In the next place, I perceive a difference in form, the ventral outline of these specimens being decidedly bulged or more excurved than that of *Kelliella*. In addition to this, there is a slight variation in the dentition, which accurate figures alone could well explain, and finally, in the minute specimens in question, I find a slight dorsal ridge, which marks off a posterior area, of which ridge I can discover no trace in *Kelliella*.

The fry of *Callocardia adamsii* must resemble this species very closely in form and dentition, but, judging from the apices of the known specimens, which may not, however, be full grown, it would be more strongly concentrically sculptured.

Length and height 4 mm.

Habitat.—Station 73, west of Azores, in 1000 fathoms: also Station 78, off San Miguel, at a depth of 1000 fathoms.

Family Cardiidæ.

Subfamily Cardiinæ.

Cardium, Linné.

Cardium (*Acanthocardium*) *setosum*, Redfield.

Cardium setosum, Redfield, Ann. Lyceum Nat. Hist., New York, 1846, vol. iv. pl. v. p. 168, pl. xi. figs. 1, *a*, *b*, *c*.

Habitat.—Station 212, south of the Philippine Islands, in 10 to 20 fathoms; sand.

This interesting species was originally described from Chinese examples.

With it, in my opinion, should be united the *Cardium latum* of Chemnitz, Reeve, Römer, and other authors, which appears to be a different shell from that described by Born. The latter author's description (Test. Mus. Vindobon., p. 48) certainly accords better with the well-known *Cardium bullatum* of the West Indies than with the shell identified by the above authors.

Having very carefully compared the shell figured by Reeve (Conch. Icon., fig. 21) with examples of *Cardium setosum*, I am unable to discover any distinctions, except a slight difference in form, a character very variable in many species of this genus.

Cardium (*Acanthocardium*) *papillosum*, Poli.

Cardium papillosum, Poli, Test. utr. Sicil., vol. ii. p. 56, pl. xvi. figs. 2–4.
Cardium papillosum, Reeve, Conch. Icon., vol. ii. fig. 111.
Cardium papillosum, Philippi, Enum. Moll. Sicil., vol. i. p. 51, vol. ii. p. 38.
Cardium papillosum, Hanley, Cat. Rec. Shells, p. 137, pl. xvii. fig. 6.
Cardium papillosum, Jeffreys, Brit. Conch., vol. ii. p. 275, vol. v. pl. xxxv. fig. 1.
Cardium (*Acanthocardium*) *papillosum*, Römer, Conch.-Cab., ed. 2, p. 32, pl. xi. fig. 1.

Habitat.—Station 75, off Fayal, Azores, in 50 to 90 and 500 fathoms; and off Tenerife, Canaries, in 70 fathoms.

Cardium (*Acanthocardium*) *sueziense*, Issel (Pl. VIII. figs. 2–2*b*).

Cardium sueziensis, Issel, Mal. Mar. Rosso, p. 76, pl. iii. fig. 4 (not good).

Testa alba, inæquilateralis, mediocriter convexa, irregulariter rotundata, postice lata, oblique subtruncata, antice angustior, arcuata, costis radiantibus circiter 25 confertim tuberculatis ornata. Margo dorsi anticus brevis, arcuatim descendens, posticus rectiusculus, sursum inclinatus. Umbones parvi, paulo supra marginem dorsalem producti. Pagina interna alba, radiatim sulcata, ad marginem fortiter denticulata.

This species is about as long as high, irregularly rounded, narrower in front than behind, rather inequilateral, pure white, and ornamented with about twenty-five tuber-

culated ribs. These are very much broader than the intervening grooves, and of different widths, the widest being down the anterior side, and the narrowest at the opposite end. The tubercles upon them are closely packed and compressed, or, in other words, transversely elongated, a feature especially observable upon the stoutest ribs. The beaks are moderately prominent, well turned over towards the front, and decidedly antemedian. The dorsal margin descends very suddenly in a slight curve in front, but rises somewhat in a straightish line behind the beaks. The anterior end is broadly arcuate, gently rounding into the ventral margin, which is also widely curved. The hinder extremity has a tendency to oblique truncation, although the boundary is in reality on a gentle curve. It joins the dorsal margin in a rounded angle having a high-shouldered appearance, the result of the rising of the dorsal line. The interior is white, radiately narrowly grooved and rather strongly dentate along the margin.

Length 7 mm., height 7, diameter 5.

Habitat.—Off Levuka, Fiji Islands, in 12 fathoms (Challenger); Gulf of Suez (Issel and MacAndrew).

This very pretty little shell, which probably attains a larger size, is chiefly characterised by its form and the closely packed transverse tubercles upon the ridges. Having carefully compared specimens from Fiji with examples from the Gulf of Suez, I am unable to discover any distinctions except that in the former there is an absence of colour, due probably to their dead condition.

Cardium (*Bucardium*) *mirabile*, Deshayes (Pl. VIII. figs. 1–1*c*).

Cardium mirabile, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 332.

Habitat.—Station 203, Philippine Islands, in 12 to 20 fathoms; mud.

This beautiful species bears some resemblance to *Cardium asiaticum*, but has fewer and stouter ribs, has not the posterior prominence of that species, and is remarkable on account of the short white spines upon the costæ.

Cardium (*Bucardium*) *tenuicostatum*, Lamarck.

Cardium tenuicostatum, Lamarck, Anim. sans vert., ed. 2, vol. vi. p. 392.
Cardium tenuicostatum, Delessert, Recueil, pl. xi. figs. 6, *a–c*.
Cardium tenuicostatum, Sowerby, Conch. Ill., figs. 36, 62.
Cardium tenuicostatum, Reeve, Conch. Icon., vol. ii. fig. 50.
Cardium tenuicostatum, Römer, Conch.-Cab., ed. 2, p. 69, pl. xii. figs. 6, 7.
Cardium pallidum, Römer, *loc. cit.*, fig. 92.
Cardium radiatum, Römer, *loc. cit.*, fig. 89.

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms; also Station 208, Philippine Islands, in 18 fathoms.

This species is found at the Philippine Islands, on the east and west coasts of Australia, and also on the shores of Tasmania. I fail to appreciate the distinctions pointed out by Reeve with regard to *Cardium pallidum* and *Cardium radiatum*.

All the forms have exactly the same kind of epidermis, and differ only in the amount of colour and somewhat in outline. Some of the specimens from Port Jackson are very pretty, having the ribs pinkish-red interrupted by concentric pale irregular zones. Other examples from Swan River are more or less suffused throughout with a pinkish tint, the interior exhibiting a vivid purple-pink below the beaks.

Cardium (*Bucardium*) *australe*, Sowerby.

Cardium australe, Sowerby, Proc. Zool. Soc. Lond., 1840, p. 105.
Cardium australe, Sowerby, Conch. Ill., figs. 12, 12*.
Cardium australe, Römer, Conch.-Cab., ed. 2, p. 70, pl. xii. figs. 8, 9.
Cardium australe, Reeve, Conch. Icon., vol. ii. pl. xix. fig. 97.
Cardium pulchrum, Reeve, *loc. cit.*, fig. 98.

Habitat.—Off Levuka, Fiji, in shallow water; and Station 208, Philippine Islands, in 18 fathoms.

This species has already been recorded from the coasts of Australia and China, from the Cape of Good Hope, the island of Rodriguez, and the Mauritius. Apparently it never attains nearly so large a size as *Cardium tenuicostatum*, which it closely resembles in many respects. It is, however, rather higher in proportion to the length, has more prominent umbones, is narrower above, smoother, more glossy, differently coloured, has stronger sculpture between some of the posterior riblets, which are not carinate down the middle, and it is not apparently adorned with an epidermis, judging from the series of specimens which I have examined.

A single shell from Station 208 constitutes a peculiar variety, differing from the normal form in being higher and narrower, and rather more finely and more numerously costate anteriorly and upon the central portion of the valves. It is also remarkable in having the umbo of the left valve stained purplish-red, that of the right being white.

Cardium (*Bucardium*) *multispinosum*, Sowerby.

Cardium multispinosum, Sowerby, Proc. Zool. Soc. Lond., 1840, p. 106.
Cardium multispinosum, Sowerby, Conch. Ill., figs. 38, *a*, *b*.
Cardium multispinosum, Hanley, Rec. Biv. Shells, pp. 137 and 363, pl. xvi. fig. 58.
Cardium multispinosum, Reeve, Conch. Icon., vol. ii. pl. ii. fig. 10.
Cardium multispinosum, Römer, Conch.-Cab., ed. 2, p. 67, pl. xii. figs. 1, 2.

Habitat.—Stations 188 and 189, both west of Cape York, North Australia, at depths of 28 and 25 fathoms; green mud.

This species was found at low water in sandy mud and also at a depth of from 6 to 25 fathoms at the Philippine Islands by Mr. Cuming, and Mr. J. Reeves presented to the British Museum specimens collected by himself on the coast of China.

Cardium (*Bucardium*) *pulchellum*, Gray.

Cardium striatulum, Sowerby, Proc. Zool. Soc. Lond., 1840, p. 105.
Cardium striatulum, Sowerby, Conch. Ill., figs. 16 and 45.
Cardium striatulum, Reeve, Conch. Icon., vol. ii. fig. 60.
Cardium striatulum, Hutton, Man. New Zealand Moll., p. 153.
Cardium pulchellum, Gray, Dieffenbach's Travels in New Zealand, vol. ii. p.252.
Cardium pulchellum, Reeve, Conch. Icon., fig. 42.
Cardium novæ zelandiæ, Deshayes, MS. in Mus. Cuming (?).

Habitat.—Station 162, off East Moncœur Island, Bass Strait, in 38 to 40 fathoms; Station 161, off Port Philip, South Australia, in 38 fathoms; and at Port Jackson, New South Wales, in 2 to 10 fathoms.

I cannot agree with Reeve, Angas, and Hutton in distinguishing *Cardium pulchellum*. Reeve, from this species. I can discover no difference of sculpture, and the extra brightness of the red rays is unimportant and variable. The name *striatulum* being preoccupied by Brocchi in 1814 for a fossil species, that proposed by Gray is here retained. This species is very abundant in some parts of New Zealand, and apparently the only one found on the shores of that country. It ranges as far north as Port Jackson on the Australian coast, from which place it has been previously recorded by Mr. G. F. Angas.

Cardium (*Papyridea*) *bullatum*, ((Linn. ?) Chemnitz).

Solen bullatus (?), Linné, Syst. Nat., ed. 12, p. 1115.
Solen bullatus, Chemnitz, Conch.-Cab., vol. vi. p. 65, pl. vi. figs. 49, 50.
Cardium bullatum, Reeve, Conch. Icon., vol. ii. fig. 8.
Cardium (*Papyridea*) *bullatum*, Römer, Conch.-Cab., ed. 2, p. 74, pl. xii. figs. 13–16.
Cardium (*Fulvia*) *bullatum*, Chenu, Man. de Conch., vol. ii. p. 109, figs. 500–502.
Cardium soleniforme, Bruguière, Ency. Méth., vol. i. p. 235.
Cardium soleniforme, Wood, General Conch., p. 233, pl. lvi. fig. 3.
Cardium aspersum, Sowerby, Proc. Zool. Soc. Lond., 1833, p. 85.
Cardium aspersum, Sowerby, Conch. Ill., fig. 15.
Cardium asperum, Römer, *loc. cit.*, pp. 76 and 122.
Cardium hiulcum, Reeve, *loc. cit.*, fig. 123 (*exemplum distortum*).
Cardium hiulcum, Chenu, Man. Conch., vol. ii. p. 109, fig. 499.
Cardium latum, Born., probably (*non auctorum*) Test. Mus. Vindobon., p. 48, pl. iii. fig. 8.

Habitat.—Bahia, Brazil, in 7 to 20 fathoms.

This well-known West Indian shell has already been recorded from several islands belonging to that group and from St. Elena and Monte Christe on the west coast of Central America. The shell described by Reeve as *Cardium hiulcum*, from an unknown locality, is unquestionably a mere distorted half-grown example of this species. In the Report on the Mollusca of the west coast of America, Dr. P. P. Carpenter states that he considers *Cardium asperum* perfectly distinct from *Cardium bullatum*. In this opinion I cannot concur, for, having closely studied the two forms, I fail to discover any constant and sufficient reasons for separating them specifically.

Cardium (*Papyridea*) *semisulcatum*, Gray.

Cardium semisulcatum, Gray, Annals of Philosophy, 1825, vol. ix. p. 137.
Cardium ringiculum, Sowerby, Proc. Zool. Soc. Lond., 1848, p. 106.
Cardium ringiculum, Sowerby, Conch. Ill., fig. 11.
Cardium ringiculum, Hanley, Rec. Biv. Shells, p. 136.
Cardium ringiculum, Reeve, Conch. Icon., vol. ii. fig. 115.
Cardium ringiculum, d'Orbigny, Sagra's Hist. de Cuba, vol. ii. p. 305.
Cardium (*Papyridea*) *ringiculum*, Römer, Conch.-Cab., ed. 2, p. 76, pl. xii. figs. 17, 18.
Cardium petitianum, d'Orbigny, *op. cit.*, p. 309, pl. xxvii. figs. 50–52.

Habitat.—Simon's Bay, Cape of Good Hope, in 15 to 20 fathoms.

Gray's name has hitherto been overlooked. In the British Museum the types which he described are still preserved, and accord with respect to colour with his brief diagnosis. They consist of five odd valves, one of them being totally white, two pale lemon-yellow, the fourth light red, and the remaining specimen white anteriorly and pink behind.

I am inclined to think with Reeve that this species does not occur at Ceylon as stated by Sowerby, but that it will be found restricted to the Atlantic. It is very interesting to find this West Indian form ranging eastward as far as the Cape.

Cardium (*Papyridea*) *transversale*, Deshayes (Pl. VIII. figs. 3–3*b*).

Cardium transversale, Deshayes, Proc. Zool. Soc. Lond., 1854, p. 333.

Habitat.—Station 75, off Fayal, Azores, at a depth of 450 fathoms; and off Tenerife, Canary Islands, in 70 fathoms (Challenger); Alboran Island (Deshayes).

This species, as far as at present known, is of small size, the largest specimen examined being only 6 mm. long, 4 high, and 3 in diameter. It is oblong, rounded anteriorly, and obliquely truncated behind. It is very inequilateral, white in front and

burnt-brown posteriorly, where some of the radiating costæ are spotted with white. The sculpture consists of about twenty-three ribs of different thickness, a few upon the posterior side being more elevated and thicker than the rest. Four or five others situated on the same side, but above those referred to, are ornamented with strong white scales. The interstices between the costæ exhibit rather well-marked lines of growth, which cross the ribs upon the anterior portion of the valves, thus producing a slightly nodose appearance. The umbones are small, but very slightly raised above the hinge-line, and located a long way in advance of the middle. The hinge is composed of a single prominent cardinal tooth in the left valve, which fits in between two denticular prominences in the right. The anterior lateral teeth are much approximated to the cardinals, the posterior being very remote. The interior of the valves is coloured like the exterior, deeply grooved and strongly dentate at the margin.

Cardium (*Lævicardium*) *norvegicum*, Spengler, var.

Cardium norvegicum, Spengler, Forbes and Hanley, Brit. Moll., vol. ii. p. 35, pl. xxxi. figs. 1, 2.
Cardium norvegicum, Römer, Conch.-Cab., ed. 2, p. 83, pl. xiii. figs. 3–6.
Cardium norvegicum, Jeffreys, Brit. Conch., vol. ii. p. 294, vol. v. pl. xxxv. fig. 7.

Habitat.—St. Vincent, Cape Verde Islands, in 7 to 20 fathoms.

The few shells from this locality are scarcely so oblique and pointed behind as more northern specimens, the epidermis is thinner, and the valves are rather more vividly spotted with a pinkish-brown tint. The species has not previously, I believe, been found so far south. The West Indian species, *Cardium glabratum*, Römer (=*Cardium lævigatum*, Reeve, *non* Linn.), might almost be considered a variety.

Cardium (*Fragum*) *medium*, Linné.

Cardium medium, Linné, Syst. Nat., ed. 12, p. 1122.
Cardium medium, Wood, Index Test, pl. v. fig. 5.
Cardium medium, Reeve, Conch. Icon., vol. ii. fig. 30.
Cardium (*Fragum*) *medium*, Römer, Conch.-Cab., ed. 2, p. 102, pl. iv. figs. 5–7.

Habitat.—Station 113A, off Fernando Noronha Island, north-east of Brazil, in 25 fathoms; volcanic sand and gravel.

This is a well-known West Indian species, and is closely represented on the west side of America by *Cardium biangulatum* and *Cardium planicostatum*.

Cardium (*Fragum*) *fornicatum*, Sowerby.

Cardium fornicatum, Sowerby, Proc. Zool. Soc. Lond., 1840, p. 110.
Cardium fornicatum, Sowerby, Conch. Ill., fig. 48.
Cardium fornicatum, Reeve, Conch. Icon., pl. xx. fig. 110.
Cardium adamsii, Reeve, Voy. "Samarang," p. 77, pl. xxii. fig. 2.

Habitat.—Station 172, off Nukalofa, Tongatabu, in 18 fathoms; coral mud.

This charming species was obtained off the Bornean coast during the voyage of the "Samarang." It is easily recognised by the numerous slender costellæ, which are most beautifully adorned with very numerous short hollow spines.

Cardium (*Fragum*) *imbricatum*, Sowerby.

Cardium imbricatum, Sowerby, Proc. Zool. Soc. Lond., 1840, p. 110.
Cardium imbricatum, Sowerby, Conch. Ill., fig. 48.
Cardium imbricatum, Reeve, Conch. Icon., vol. ii. fig. 28.

Habitat.—Off Cape York, North Australia, in 3 to 12 fathoms (Challenger); Swan River, West Australia (Sowerby).

Cardium (*Fragum*) *torresi*, n. sp. (Pl. VIII. figs. 4–4*b*).

Testa parva, paulo inæquilateralis, mediocriter globosa, tenuis, albida, radiatim tenuissime costellata, hic illic radiatim granulata, et liris transversis crebris inter costellis cancellata. Umbones magni, prominentes, paulo ante medium collocati. Latus anticum rotundatum, posticum subquadratum, inferne subangulatum.

This is a very beautiful little shell, and readily recognised by its remarkable sculpture. It is a little longer than high, rather ventricose, slightly inequilateral, white, thin, and very beautifully sculptured with about seventy very fine thread-like radiating lines, separated by equally fine grooves which have very numerous cross-bars producing a punctured appearance. These cross-bars do not form a concentric series, but are irregularly disposed, and, like the costellæ, are obsolete on the dorsal areas. In addition to this ornamentation the valves are further adorned with radiating series of small tubercles or blunt spines which fall not upon the costæ as usual, but in certain of the interstices at rather unequal distances apart.

The anterior side is a trifle shorter than the posterior, and broadly rounded, as is also the lower margin. The hinder side is slightly narrower than the front, and more or less truncated, joining the ventral outline at a slight angle. The umbones are fairly

prominent, well incurved and glossy at the apex. The interior of the valves is white, faintly radiately substriated, minutely denticulated upon the margin, and exhibits a slight ridge or angulation from the beaks to the lower hinder extremity.

Length $4\frac{1}{2}$ mm., height $4\frac{1}{4}$, diameter $3\frac{1}{2}$.

Habitat.—Station 188, south of New Guinea, at a depth of 28 fathoms; green mud.

The above dimensions do not probably indicate the maximum size attained by this species, but the peculiarity of the sculpture is such as to warrant the description of these possibly young shells. The position of the tubercles in the grooves, and not upon the intervening costellæ, is most unusual.

Family VERTICORDIIDÆ.

Verticordia, Searles Wood.

This genus and *Pecchiolia* of Meneghini closely resemble each other in general outward appearance and as regards the hinge-characters, and possibly may be identical from a generic point of view, although this has still to be clearly demonstrated. If they be the same, it then becomes questionable whether the more recent name *Pecchiolia* should be adopted, as has been done by Jeffreys and others, on the ground that *Verticordia* was preoccupied in botany. Considering the difference of opinion upon this point, the uncertainty of their identity, and that the name *Verticordia* has been employed by such excellent authorities as Fischer, Dall, and Stoliczka, I prefer to adopt the views of these writers rather than follow that expressed by Dr. Gwyn Jeffreys in this matter. I should here remark that the last named author not only considers the two forms in question identical, but unites with them *Lyonsiella* of Sars, a genus, as already pointed out by Heilprin,[1] which is very different both as regards the shell and animal. Our knowledge of the soft parts of *Verticordia* is very incomplete at present; but the observations of A. Adams[2] show that they differ from those of *Lyonsiella* in more than one particular.

The following species I regard as true *Verticordia*:—(1) *Verticordia cardiiformis*, J. Sowerby; (2) *Trigonulina ornata*, d'Orbigny; (3) *Verticordia novemcostata*, Adams and Reeve; (4) *Hippagus acuticostatus*, Philippi; (5) *Verticordia deshayesiana*, Fischer; (6) *Verticordia japonica*, A. Adams; (7) *Verticordia multicostata*, A. Adams; (8) *Verticordia granulata*, Seguenza; (9) *Verticordia calata*, Verrill; (10) *Verticordia australiensis*, Smith; (11) *Verticordia fischeriana*, Dall; (12) *Verticordia elegantissima*, Dall; (13) *Verticordia arenosa*, Smith; (14) *Verticordia quadrata*, Smith; (15)

[1] *Proc. Acad. Nat. Sci. Philad.*, 1881, p. 423.

[2] *Ann. and Mag. Nat. Hist.*, 1862, ser. 3, vol. ix. p. 224.

Pecchiolia gibbosa, Jeffreys; (16) *Pecchiolia angulata*, Jeffreys; (17) *Pecchiolia tornata*, Jeffreys; (18) *Pecchiolia sinuosa*, Jeffreys.

Of these Nos. 2 and 3 appear to be identical, and Nos. 5 and 6 also constitute but one and the same species; but whether or not No. 4 belongs to the same species at present I am uncertain; but that *Verticordia multicostata*, A. Adams, is not the same as *Verticordia granulata*, Seguenza, as stated by Jeffreys, I feel fully convinced if any reliance is to be placed upon the figures of the latter species in the Journal de Conchyliologie. The form of the Japanese shell is different, and the ribs twenty-six in number, or six more than mentioned by Seguenza. His specimen, however, may have been imperfect, which would account for the difference of outline.

The following species have been assigned to this genus, but in my opinion they belong to *Lyonsiella*, namely,—*Pecchiolia insculpta*, Jeffreys; *Pecchiolia subquadrata*, Jeffreys; *Pecchiolia abyssicola*, Sars; and *Lyonsiella gemma*, Verrill.

All of them have the hinge-line in both valves destitute of teeth, and the ligament internal, and in two instances it is stated to be supported by an ossicle. Although in the case of *Lyonsiella gemma* this is not mentioned, there seems to be every probability of its being present. Jeffreys does not describe the hinge of his *Pecchiolia insculpta*, but having had an opportunity recently of examining the type, I find it corresponds with that of *Lyonsiella* in every respect.

Verticordia ornata (d'Orbigny), var.

Trigonulina ornata, d'Orbigny, in Sagra's Hist. de Cuba, vol. ii. p. 292, pl. xxvii. figs. 30–33.
Trigonituna ornata, Chenu, Man. de Conch., vol. ii. p. 169, fig. 843.
Verticordia ornata, Fischer, Journ. Conch., 1862, vol. x. p. 380.
Verticordia ornata, Dall, Bull. Mus. Comp. Zoöl., vol. ix., No. 2, p. 105.

Habitat.—Station 33, off Bermuda, in 435 fathoms; coral mud.

Two right and one left valves from this locality differ slightly in form and in the greater number and more slender character of the ribs. These are twelve in number, two of them on the hinder dorsal slope, being separated from the rest by a broad unribbed space. The ventral margin is somewhat angular at the middle, curved upward in front and obliquely truncate behind, forming with the arcuate dorsal margin a rather acute extremity. The cardinal tooth of the right valve is very strong and prominent, and the posterior dorsal edge is very deeply grooved for the reception of the margin of the left valves, in which the margin of the lunule is much thickened, forming a sort of tooth, which fits into a pit in front of the denticle in the other valve. The ligament is in a groove under the dorsal margin behind the umbones, and is supported in both valves by a distinct ridge. The distribution of this species is very remarkable, it having been recorded from the West Atlantic, California, and the China Seas.

Verticordia deshayesiana, Fischer.

Verticordia deshayesiana, Fischer, Journ. de Conch., 1862, vol. x. p. 35, pl. v. figs. 10, 11.
Verticordia japonica, A. Adams, Ann. and Mag. Nat. Hist., 1862, ser. 3, vol. ix. p. 234.

Habitat.—Station 122, off Pernambuco, in 350 fathoms; also Station 185, east of Cape York, North Australia, in 155 fathoms.

A single valve from each of the above localities is all that was obtained of this species. They are of the same convex character as the shells described by Fischer and Adams, and not so compressed as *Verticordia cardiiformis* from the Crag, which is considered identical by Jeffreys. I have never seen a specimen of Philippi's *Verticordia acuticostata*, but, judging from his description and figure alone, I am not convinced that it is the same species as *Verticordia deshayesiana*. His description and figure of the costæ do not accord with the species before me.

Verticordia australiensis, n. sp. (Pl. XXV. figs. 6–6*b*).

Testa tenuissima, parva, late cordata, inæquilateralis, alba, tenuiter radiatim lirata, liris parum elevatis, minutissime granulata. Margo dorsi posticus leviter arcuatus, obliquus, anticus infra umbones excavatus. Ventris margo in medio acute rotundatus, utrinque valde adscendens. Umbones prominentes, ad apicem aliquanto obtusi, modice ante medium siti.

This species is small, very fragile, white, rather inequilateral, broadly heart-shaped, longer than high, and moderately convex, and exhibits a very faint depression at the posterior end from the beaks to the ventral margin. It is, as seen under the microscope, everywhere minutely granular, and ornamented with fine, very slightly raised, radiating liræ, which are about twenty-four in number and subequidistant. The dorsal margin is oblique on both sides, longer posteriorly than in front, and a little excurved, being decidedly excavated anteriorly beneath the beaks. These are fairly prominent, rather large at the apex, curved towards the front, and situated decidedly in advance of the centre. Both ends of the shell are narrowed, especially the anterior, and sharply rounded as is the lower outline at the middle, which is much ascending on both sides. The interior is glossy and the muscular scars and the pallial line not discoverable. The hinge is composed of a single tubercular tooth in the right valve immediately beneath the umbo, which fits into a corresponding break in the hinge-line in the left valve, behind which there is an indistinct tooth. The posterior dorsal margin of the right is also distinctly grooved for the reception of the acute edge of the left.

Length $3\frac{2}{3}$ mm., height $3\frac{1}{4}$, diameter $2\frac{1}{4}$.

Habitat.—Station 185B, east of Cape York, North Australia, at a depth of 155 fathoms ; coral sand.

This species differs from *Verticordia multicostata*, A. Adams, in form and the much less pronounced liræ.

Verticordia woodii, n. sp. (Pl. XXV. figs. 7–7*b*).

Testa ventricosa, inæquilateralis, tenuis, irregulariter obtusatim cordata, sordide albida, epidermide dilute fuscescente subarenacea induta, radiatim inconspicue lirata, æque longa ac alta, intus margaritacea, obsolete radiatim substriata. Margo dorsi anticus brevis, prope umbones leviter excavatus, parum obliquus, posticus longior, paulo arcuatus, subhorizontalis. Margo ventralis dorsali multo angustior, rotundatus, lateribus vix convexis junctus. Umbones magni, prominentes, antice incurvati, haud acuti, aliquanto ante medium collocati. Lunula parva, depressa, cordiformis. Dens cardinalis valvæ dextræ prominens, tuberculiformis, mediocriter magnus. Ligamentum lineare, marginale, partimque internum. Cicatrix anterior profunda, postica et linea pallii indistinctæ.

This shell is about as long as high, very thin, rather ventricose and inequilateral. It is obliquely obtusely subcordate, dirty white, and clothed with a most remarkable pseudo-epidermis, which to the naked eye has a pale brown granular or sandy appearance. Under the microscope the surface is seen to be covered with small granules, arranged pretty regularly in numerous close-set radiating series, and being transparent, when held up to the light, giving to the valves a punctate appearance as if pricked with a needle. On washing the surface with very weak dilute acid the granules quickly dissolve, leaving the surface punctate all over, for each granule appears to rest in a minute circular pit. In addition to this peculiar sculpturing the surface is marked with about thirty radiating rusty red elevated lines. The outline is broad above, roundly shouldered, and narrows towards the lower margin. The dorsal line is a little oblique in front, short, and a trifle concave ; posteriorly it is longer, faintly arcuate, and nearly horizontal. The ventral margin is rounded, and curves sharply into the somewhat straight sides, of which the hinder is less perpendicular than the anterior. The umbones are rather large, prominent, well-curved over towards the front, not quite approximated, nor acute. The lunule is heart-shaped, a little depressed, not circumscribed, and unequally proportioned in the two valves, two-thirds of it being in the right. The hinge is composed of a single conspicuous, tubercular, pearly tooth in the right valve, situated below the margin, and separated from it by a groove, which receives a marginal sub-tooth or thickening in the left valve.

The ligament is subexternal in part and partly internal. The former portion is linear and extends all along the hinder dorsal margin, and is partly concealed by the right valve overlapping the left. The internal portion is not nearly so long, also linear and slightly divergent from the other. The anterior muscular scar is very deep, whilst the posterior and the pallial line are not noticeable. The interior is dull pearly, and obsoletely substriated in a radiating manner.

Length 10 mm., height 10½, diameter 8.

Habitat.—Station 122, off Pernambuco, Brazil, at a depth of 350 fathoms; also Station 24, off Culebra Island, West Indies, in 390 fathoms.

This species is very remarkable on account of the peculiar character of its sculpture, its ventricose form, and broad rounded upper angles. I have named it in remembrance of the late Searles Wood, author of the genus *Verticordia*.

Verticordia quadrata, n. sp. (Pl. XXV. figs. 8–8*b*).

Testa quadrata, inæquilateralis, albida, minute granulata, radiatimque obsolete lirata; margo dorsi utrinque declivis, antice valde concavus, brevis, postice longior, vix excurvatus, subrectus, rotundato-angulatim in latera ambiens. Margo ventris subangulatim rotundatus, utrinque subrecte adscendens. Lunula cordata, valde excavata. Umbones prominentes, antice bene incurvati. Pagina interna albo-margaritacea, nitida. Cicatrix anterior profunda, postica inconspicua.

This species is of a peculiar square form, three of the sides being subequal in length and the fourth shorter. It is dirty whitish, everywhere covered with a fine granulation, faintly radiately lirate, decidedly inequilateral, and moderately convex. The anterior dorsal margin is very concave beneath the beaks and rather oblique, the posterior being much longer, nearly rectilinear, and equally sloping. The sides converge towards the base, are straightish (or the posterior is faintly incurved at the middle), run into the ventral outline in a rather sudden rounded curve, and join the dorsal margins in rounded angles. The umbones are moderately prominent, much curved over upon the deeply sunken cordate lunule, and located about one-third of the length from the anterior end. The interior is pearly white, and exhibits a deep anterior muscular scar and two minute pits beneath the lunule (in the left valve), the posterior impression being indistinct. The ligament is partly marginal and partly contained in a narrow groove within the margin. The hinge-line in the left valve is apparently toothless.

Length 7 mm., height 6½, diameter 5.

Habitat.—Station 85, off Palma, Canaries; depth, 1125 fathoms; volcanic mud.

This species is finely granulose, like *Verticordia woodii*, but is smaller, more solid.

more quadrate, and has fewer radiating lines. As but a single left valve was obtained I am unable to complete the description of the hinge; however, the right valve would probably have a single tubercular tooth.

Verticordia tornata (Jeffreys) (Pl. XXV. figs. 9–9*b*).

Pecchiolia tornata, Jeffreys, Ann. and Mag. Nat. Hist., 1876, vol. xviii. p. 494.

Habitat.—Station 70, west of the Azores, in 1675 fathoms; also Station 106, Mid Atlantic, between Sierra Leone and Brazil, in 1850 fathoms.

Of this species only some fragments were described by Jeffreys. Two perfect valves from Station 70, and a complete specimen from Station 106, were obtained by the Challenger, and enable me to supplement the description in the Annals.

This species is globose, somewhat *Isocardia*-like, nearly equilateral, but a very little inequivalve, the right valve very slightly overlapping the left along the ventral margin and the hinder dorsal slope. The minute tubercles are arranged in more or less regular radiating series, their irregularity being especially noticeable at the hinder end. The umbones are well produced, involuted and directed towards the front, and the ligament is external and placed in a small sunken groove upon the hinge-line behind the conspicuous prominent tooth in the right valve, and posterior to the thickened termination of the front dorsal margin in the left.

Length 13 mm., height 13, diameter 10.

The somewhat different position of the ligament in this species is, I think, hardly of generic importance, as the form and granular surface so closely approach *Verticordia woodii* and *Verticordia quadrata*, which connect it with typical species such as *Verticordia ornata* and *Verticordia australiensis*.

Family Tridacnidæ.

Tridacna, Bruguière.

Tridacna crocea, Lamarck.

Tridacna crocea, Lamarck, Anim. sans vert., ed. 2, vol. vii. p. 10.

Habitat.—Station 186, off Cape York, North Australia, at a depth of 8 fathoms; coral mud.

The single specimen from the above locality agrees very fairly with the figure in the "Conchylien-Cabinet" of Chemnitz referred to by Lamarck. The species of this genus are extremely puzzling, and I believe that the young of the largest known shell (*Tridacna*

gigas) has never been satisfactorily shown. In these large shells the lamellæ become worn down and much incrusted with coralline growth, so that it is impossible to know what has been the style of ornamentation when young. I should not be surprised if *Tridacna squamosa* or *Tridacna rudis* should prove to be the early stages of this colossal form.

Family Chamidæ.

Chama, Linné.

Chama gryphoides, Linné.

Chama gryphoides, Linn., part. Syst. Nat., ed. 12, p. 1139.
Chama gryphoides, Poli, Test., vol. ii. p. 172; Atlas, pl. xxiii. figs. 3, 4, 20.
Chama gryphoides, Philippi, Enum., vol. i. p. 68.
Chama gryphoides, Weinkauff, Conch. Mittelm., vol. ii. p. 150.

Habitat.—Off Teneriffe, Canary Islands, in 70 fathoms; and Station 75, off Fayal, Azores, at a depth of 450 fathoms.

This species is found in several parts of the Mediterranean, and probably ranges even farther south than the Canary Islands; indeed Krauss (Südafrik. Moll., p. 19) has already recorded specimens collected on the coast of Natal which he considered belonged to this species. It has also been found fossil in several places (*vide* Weinkauff, *op. cit.*, *supra*).

Chama brassica, Reeve.

Chama brassica, Reeve, Conch. Icon., vol. iv. pl. vi. fig. 31.

Habitat.—Reefs off Tongatabu (Challenger); Philippine Islands (Cuming).

The upper of the brown rays represented in the above figure occupies a distinct depression. The interior of this species is for the most part white, tinged and spotted more or less with purple-pink upon the margin, which is smooth and not crenulated as in many other species.

Chama sulphurea, Reeve.

Chama sulphurea, Reeve, Conch. Icon., vol. iv. pl. iii. fig. 14.

Habitat.—Station 187, near Cape York, North Australia, in 6 fathoms (Challenger); Island of Mindoro, Philippines (Cuming).

The Challenger specimen is somewhat differently coloured from that figured by Reeve. The spines on the hinder part are white, set upon a rich red ground, those upon the anterior half of the upper valve being lightish brown at the tips and white at the bases. In this species the lower valve is angulated down the middle, half, or a little more, being attached and the remainder arising at an oblique angle. The umbo in this valve is considerably curved over towards the front and away from the dorsal edge, but not nearly to the same extent as in *Chama multisquamosa*, an allied form. The interior of this valve is generally whitish in front, and more or less stained with purple-rose or purple-brown upon the hinder portion or non-attached half. The upper valve has usually less colour within, generally exhibiting a more or less distinct purplish stain from the umbo down the hinder central part and some purplish spots upon the outer margin. The spines upon the exterior of the lower valve vary in colour, being either white, brown, yellow, or pinkish.

Chama cardita-formis (?), Reeve.

Chama cardita-formis, Reeve, Conch. Icon., vol. iv. pl. vi. fig. 33.

Habitat.—Station 208, Philippine Islands, in 18 fathoms; blue mud.

The type of this species in the British Museum has been very much over-cleaned, and the spines to a great extent worn down so that it is impossible to pronounce with certainty whether the pretty little specimen from the above locality be without doubt conspecific. It is of the same *Cardita*-like form, but has a peculiar colouring. The short hollow spines in the free valve, which radiate in series from the umbo, have a pinkish-red spot within at their bases, which are only seen when the shell is placed in a certain position. The apices of both valves are pink, and the interior of the upper valve exhibits a broad brown stain upon the hinder half. The figure in the Conchologia Iconica is far from correct, the spines down the posterior side being greatly exaggerated.

Chama jukesii, Reeve.

Chama jukesii, Reeve, Conch. Icon., vol. iv. pl. vii. fig. 39.

Habitat.—Station 186, off Cape York, North Australia, in 8 fathoms; coral mud.

The type of this species in Cuming's collection was collected by Mr. J. B. Jukes at Cape Upstart, also on the north coast of Australia. I cannot discover any good reasons for separating either *Chama pellis-phocæ* or *Chama fibula* (both of Reeve) from this species.

Chama spinosa, Broderip.

Chama spinosa, Broderip, Trans. Zool. Soc. Lond., vol. i. p. 306, pl. xxxviii. figs. 8, 9.
Chama spinosa, Reeve, Conch. Icon., vol. iv. fig. 44*a*.
Chama spinosa, Angas, Proc. Zool. Soc. Lond., 1867, p. 925.

Habitat.—Port Jackson, Sydney.

A single small specimen only attached to a portion of a *Mytilus*. Angas observes that the species is "found attached to rocks at low spring tides." The type shells are said to have come from Lord Hood's Island in the Pacific Ocean.

Family Lucinidæ.

Lucina, Bruguière.

Lucina columbella, Lamarck.

Lucina columbella, Lamarck, Anim. sans vert., ed. 2, vol. vi. p. 230.
Lucina columbella, Hanley, Cat. Rec. Shells, p. 77, pl. ix. fig. 2.
Lucina columbella, Reeve, Conch. Icon., vol. vi. pl. vi. fig. 30.
Lucina columbella, Sowerby, Gen. Shells, fig. 6.
Lucina adansoni, d'Orbigny, in Webb and Berthelot's Hist. Nat. Canaries, vol. ii. part 3, p. 107, pl. vii. figs. 26–28.

Habitat.—St. Vincent, Cape Verde Islands, in 7 to 20 fathoms.

This species is also found at the Canary Islands and perhaps as far south as Senegal. The Challenger specimen is remarkably globular, being 37 mm. in length and height and 34 in diameter.

Lucina lamellata, Smith (Pl. XIII. figs. 1–1*b*).

Diplodonta lamellata, Smith, Proc. Zool. Soc. Lond., 1881, p. 38, pl. v. figs. 1–1*c*.

Testa solida, irregulariter rotundata, inæquilateralis, antice brevior, angustata, postice oblique truncata, ad extremitatem rotunde subangulata. Valvæ mediocriter convexæ, albidæ, epidermide sordide flavescente rugose striata indutæ, lamellis concentricis conspicuis ornatæ, prope marginem dorsi posticum depressæ, antice lunula lanceolata profunde excavata instructæ. Margo dorsi posticus leviter arcuatus, parum declivis, elongatus, anticus brevior, valde obliquus, concavus. Ventris margo rotundatus, anterius oblique longe ascendens. Ligamentum crassum, haud prominens, in sulco elongato profundo situm. Dentes cardinis duo in utraque valva mediocriter validi, divergentes, inæquales, lateralis unicus anticus subtuberculiformis. Pagina interna alba, cretacea, aliquanto rugosa. Cicatrix antica prelongata, angusta, fere usque ad medium testæ extensa, submitida, striata, postica irregulariter ovalis, latior.

This interesting species is regularly rounded, somewhat narrowed in front and obliquely truncate behind. It is rather solid, considerably inequilateral, moderately convex, and whitish beneath a dirty yellowish epidermis. The sculpture consists of thin elevated lamellæ which are anteriorly less developed than upon the central portion of the valves, which exhibit a shallow depression down the posterior side, a little below the dorsal margin, giving the concentric lamellæ a somewhat flexuous appearance at this part. The interstices between the lamellæ are rather roughly striated. In front of the acute umbones the valves have a deep lanceolate elongate lunular excavation defined by very sharp edges. The front dorsal outline is slightly concave, very oblique, and rather shorter than the posterior, which is a little convex and not nearly so sloping. The lower margin is well curved, and ascending obliquely in front, forms together with the dorsal line a sharply rounded pouting extremity. The hinder end is obliquely truncated, the shallow depression terminating in the middle of the straight edge which joins the dorsal and ventral margins in rounded angles. The ligament is strong, and placed in a deep groove occupying the entire length of the hinder dorsal margin, but does not project above the upper edge of the valves. The interior, with the exception of the hinge-line, muscular scars, pallial line, and outer margin, which are glossy, is chalky white, roughish and subpunctate. The anterior impression is very long and narrow, and falls obliquely within the pallial line almost to the centre of the valves. The posterior is nearly twice as broad, of an irregular oval form, and radiately striated. The hinge consists of two cardinal teeth and a single lateral in each valve. Of the former, the posterior in the right and the anterior in the left are bifid, and the lateral tooth is small and tuberculiform.

Length 47 mm., height 42, diameter 24.

Length 39 mm., height 36, diameter 16.

Habitat.—Station 311, western part of the Strait of Magellan, at a depth of 245 fathoms; blue mud.

This species I originally described as a *Diplodonta*, having overlooked the presence of the anterior lateral tooth, which in the young shells then at hand was very inconspicuous, and indeed in the adult specimens obtained by the Challenger consists merely of a slight tubercular projection. The types were dredged by Dr. Coppinger of H.M.S. "Alert," in Portland Bay, St. Andrew's Sound; also on the west side of Southern Patagonia, in 10 fathoms, on a bottom of hard sand.

Lucina ramsayi, n. sp. (Pl. XIII. figs. 2–2*b*).

Testa mediocriter convexa, subæquilateralis, rotundata, solidiuscula, alba, concentrice confertim lirata, striis radiantibus in interstitiis subpunctatim sculpta. Lunula parva, profunda. Margo dorsi anticus leviter concavus, posticus vix declivis, superne recti-

usculus. Umbones parvi, acuti, paulo supra lineam cardinis producti. Pagina interna haud nitida, punctis paucis profundis sparsis, sulcoque oblique irregulari in medio notata. Cardo in valva dextra dente primario infra apicem munitus, dente laterali antico elongato, margine exteriori sulco profundo sejuncto. Cicatrix antica superne latiuscula, inferne angustata, producta, postice irregulariter ovalis. Ligamentum internum.

This species is only a trifle longer than high, roundish, roundly shouldered above, only moderately convex, fairly strong, not quite equilateral, white, and sculptured with fine closely packed concentric lirae which become attenuated and crowded at the sides. In the grooves between them are innumerable very fine radiating lirae which produce a punctured appearance. Down the posterior side of the valves is a faintly impressed ray which is so inconspicuous that it is only seen in certain lights. In front of the beaks is a small but rather deep lunule, shaped not unlike a short spear-head. The front dorsal margin is a little concave and sloping, the posterior being less oblique, longer and straighter. The umbones are small, fairly sharp, but slightly curved over at the tip, and only a little elevated above the dorsal line. There is a single small tubercular cardinal tooth under the beak in the right valve under examination, which is all that is at present known of the species, and the anterior side exhibits a long but not much raised lateral tooth, separated from the outer margin by a deepish groove. The ligament appears to be totally internal, and contained in a furrow beneath the posterior dorsal edge. The dull interior exhibits deep scattered punctures and a strongly marked irregular impressed line extending obliquely from above the posterior muscular scar to below the anterior one. The latter is oval at the upper part, but narrowed and produced downward within the deeply impressed pallial line, the former being also somewhat oval in form.

Length 14½ mm., height 13¾, probable diameter of the perfect shell 8.

Habitat.—Port Jackson, New South Wales, in 6 to 7 fathoms.

Lucina cristata, n. sp. (Pl. XIII. figs. 3–3*a*).

Testa compressiuscula, tenuis, æquilateralis, superne breviter rostrata, antice rotundata, postice subquadrata, albida, liris concentricis tenuibis confertis postice lamellatis (lamellis impressioni radianti interruptis) instructa, in regione lunulæ impressa. Margo dorsi anticus obliquus, valde excavatus, posticus æqualiter declivis, rectiusculus. Umbones producti, acuti. Dens primarius unicus valvæ dextræ parvus, laterali utrinque inconspicuo, remoto.

This species belongs to the typical section of the genus *Lucina*, characterised by possessing primary and lateral teeth and by the concentric nature of the sculpture.

Only a single right valve is at present known, and this probably does not represent the maximum size of the species. It is rather compressed, thin, about equilateral, rather squarely truncate behind, rounded in front, and gently curved below. The small acute umbo being rather prominent, and the dorsal margin in front rather concave, the upper part of the shell has a peaked appearance. The sculpture consists of fine acute close-set liræ, which become more elevated and lamellar on the posterior side, the lamellæ being somewhat interrupted down the middle by a shallow impression, so that on the posterior dorsal margin and on a slight angle radiating from the beak to the lower hinder extremity they form two separate crests. There is a single cardinal tooth in this right valve, and a small and remote lateral on each side. The ligament lies in a narrow groove under the dorsal edge.

Length $4\frac{1}{4}$ mm., height $4\frac{1}{4}$, supposed diameter of the perfect shell 2.

Habitat.—Station 185B, east of Cape York, North Australia, in 155 fathoms; coral sand.

Lucina (*Divaricella*) *irpex*, n. sp. (Pl. XIII. figs. 4–4*a*).

Testa subcircularis, fere æquilateralis, modice convexa, alba, liris elevatis tenuibus paulo ante medium oblique divaricatis instructa, crassiuscula, spatiis incrementi concentrice gradata. Umbones parvi, vix ante medium siti, antrorsum versi, parum elevati. Margo dorsi postice oblique arcuatus, antice minus curvatus, aliquanto obliquior. Lunula minuta, profunda. Dens cardinalis in valva dextra unicus, crassus, obtusus; dentes duo valvæ sinistræ parvi, fossa triangulari sejuncti, posteriori valde obliquo. Fossa ligamenti elongata, utrinque attenuata, intra marginem sita. Cicatrix antica angusta, elongata. Margo valvarum fortiter serratus.

This species is almost circular, about as long as high, white, almost equilateral, moderately convex, and ornamented with fine, much elevated ridges or costellæ which divaricate at an angle of about 45° at a slightly arcuate and oblique line radiating from the umbo and marking off from the anterior end rather more than a third of the valve. The ridges are interrupted at intervals which mark periods of growth, by which the surface of the valves present a graduated appearance. The grooves, which are equal to or a little broader than the costellæ between them, are conspicuously deep, especially at the sides, so that the outline is prettily and strongly dentate. The margin is well curved all round, except along the anterior dorsal slope, where it is a trifle less arcuate. The beaks are small, curve over towards the front, are but very slightly raised above the hinge-line, located scarcely in advance of the centre, and have a most minute, deeply sunken lunule immediately beneath them. The hinge is composed of a single thick, obtuse tooth in the right valve which fits in between two smaller ones in the left. The ligament is internal, located in an elongate deepish groove, attenuated at both ends.

The anterior muscular impression which falls within the pallial line is narrow, elongate, and oblique.

Length 15 mm., height 14, diameter 9. Another specimen in the British Museum is $16\frac{1}{2}$ mm. long and 16 high.

Habitat.—Cape York, North Australia, in 3 to 12 fathoms.

There is only one other species with which this is likely to be confounded, namely, *Lucina macandreæ*, H. Adams, from the Gulf of Suez, which may be the same species as *Lucina ornatissima*, d'Orbigny, hereafter referred to. That species has the umbones more elevated, the lunule a little larger, the single tooth in the right valve bigger, and the anterior muscular scar much broader. But another and perhaps the most important distinction is found in the divaricating ridges. These in *Lucina macandreæ* are a trifle more slender, granular or serrated along the top, and divaricate at an angle of about 25° at the central part of the valves. On the contrary, in *Lucina irpex* the angle of divergence is much less acute, being about 45°, and the costellæ themselves, although somewhat rugose, are not serrated in the same manner. *Lucina ornata*, Reeve, is another allied species, differing from the two previously mentioned in having the divaricating ridges less elevated, broader and flat-topped, the upper edges of them being somewhat raised and carinate. The angle at which they diverge is about the same, namely 45°, as in *Lucina irpex*. This species (*Lucina ornata*) has since been described by Dr. E. von Martens[1] under the name of *Lucina* (*Divaricella*) *angulifera* from specimens collected at the Mauritius. In the British Museum there are three specimens obtained by Captain Owen, R.N., on the coast of Africa, and others collected by J. B. Jukes, Esq., at Port Jackson, New South Wales. The type-shell figured by Reeve (Conch. Icon., fig. 48) is a little abnormal in form, the anterior side being unusually sloping at the upper part, but not excavated at the lunule as represented in the figure.

Lucina (*Cyclas*) *cumingii*, Adams and Angas, is the largest species of the section *Divaricella*, and is found in Ceylon, South Australia, Tasmania, Port Jackson, and New Zealand. It should certainly be held distinct from the West Indian *Lucina dentata*, [Wood[2] = *Lucina divaricata*, Auct. (*non* Linn.) = *Lucina serrata*, d'Orbigny = *Lucina chemnitzii*, Philippi = *Lucina strigilla*, Stimpson (probably)]. It differs from that species in being larger in the adult state, has more acutely divaricating striæ, a more elongate lanceolate lunule, a more external ligament, and a single lateral denticle in each valve on the anterior side, moderately remote from the cardinal teeth, of which there is not the slightest trace in *Lucina dentata*. The front muscular scar, too, is much more elongate, and the margin of the valves is never serrated, but perfectly smooth.

Care must be taken not to confound the two West Indian forms *Lucina dentata* and *Lucina quadrisulcata*, which has also been named by C. B. Adams *Lucina americana*.

[1] Mollusca der Insel Mauritius, p. 321, pl. xxii. fig. 14.

[2] Tellina dentata, Wood, General Conch., p. 195, pl. xlvi. fig. 7.

Although sculptured externally in a very similar, in fact, almost precisely the same manner, they are readily distinguishable by certain characters within the valves. *Lucina dentata* has the margin rather coarsely dentate, the denticles at the sides corresponding with the external raised ridges, but along the ventral edge they are rather more numerous and finer. In *Lucina quadrisulcata* the margin appears almost smooth to the naked eye, but under the lens is found to be most minutely crenulated. Other distinctions in this species are the presence of a minute lateral denticle in the right valve which is located nearer the cardinal teeth than that in *Lucina cumingii*, and fits in between two small tubercular teeth in the left valve. It is usually rather more globose, has a larger lunule, which is in the right valve, and much larger cardinal teeth, the anterior in the left valve being the most conspicuous.

After a very careful examination I am unable to find any distinction in *Lucina eburnea*, Reeve, found at St. Elena, West Columbia, and Panama by Cuming, which will separate it from the West Indian *Lucina quadrisulcata*. The form and convexity are the same, and the lunule, sculpture, dentition, and the minute crenulation of the margin are quite similar.

In the fifth volume of the Voyage dans l'Amérique méridionale, p. 584, 1847, d'Orbigny gives some observations on all the recent and fossil species of this section (*Divaricella*) of *Lucina* then known to him. Of the former he mentions five, namely *Lucina divaricata*, Linn., from the Mediterranean, *Lucina quadrisulcata* (d'Orbigny), from Brazil and the West Indies, *Lucina serrata*, d'Orbigny, also a West Indian form, *Lucina sechellensis*, from the Seychelles Islands, and *Lucina ornatissima*, from the Mauritius.

The two last species, as far as I can ascertain, have never been fully described, but are merely known by the few observations which M. d'Orbigny makes upon them at the above reference. From these remarks, owing to their insufficiency, I am unable to identify the shells he had before him with any of the better known species. The former, *Lucina sechellensis*, approaches in some respects *Lucina cumingii*, and *Lucina ornatissima* may be identical with either *Lucina macandreæ* or *Lucina irpex*.

Mr. Brazier[1] makes certain observations upon *Lucina dentata* with which I cannot agree, at the same time giving a synonymy which in my opinion constitutes an extensive "lumping" of species. Such distinctions as I have pointed out in the foregoing remarks must either have altogether escaped his observation, or else he may not regard them of specific importance. He says, "this species has a very wide range over the earth's surface, but it does not differ in sculpture." The former statement would be correct if all the forms which he tabulates under *Lucina dentata* were really identical. But this is not the case in my judgment, and I believe any one who with great care will study specimens (not descriptions and figures only) of these species, will arrive at a similar conclusion, meeting not only with differences of form and dentition but also of sculpture, which Mr. Brazier has failed to perceive.

[1] *Proc. Linn. Soc. N. S. Wales*, vol. viii. p. 229.

Lucina (*Codakia*) *tigerina* (Linné).

Venus tigerina, Linné, Syst. Nat., ed. 12, p. 1133.
Lucina tigerina, Deshayes, Ency. Méth., vol. ii. p. 384.
Lucina tigerina, Reeve, Conch. Icon., vol. vi. pl. 1. fig. 3.
Lucina tigerina, Pfeiffer, Conch.-Cab., ed. 2, Veneracea, p. 260, pl. xix. figs. 1, 2.

Habitat.—North Atlantic, deep water.

This is a well-known Cuban species, and is also quoted by Reeve from the Bay of Honduras. At times it attains much larger dimensions than are represented by the above figures, a specimen in the Cumingian collection being $4\frac{1}{2}$ inches in length by $3\frac{7}{8}$ in height.

Lucina (*Codakia*) *interrupta* (Lamarck).

Cytherea interrupta, Lamarck, Anim. sans vert., ed. 2, vol. vi. p. 318.
Cytherea interrupta, Chenu, Illustr. Conch., pl. xi. figs. 1–1*b*.
Lucina interrupta, Reeve, Conch. Icon., vol. vi. figs. 5, *a*, *b*.

Habitat.—Reefs off Tongatabu, Friendly Islands (Challenger); Torres Strait (Jukes); Louisiade Archipelago (Brit. Mus.).

This is a more convex species than *Lucina tigerina*, rounder, proportionally more solid, and not so roughly sculptured. Its anterior muscular impression is of a different form, and the pallial line arises in front from the middle of the scar, whilst in *Lucina tigerina* it commences higher up.

Lucina (*Codakia*) *pecten*, Lamarck.

Lucina pecten, Lamarck, Anim. sans vert., vol. v. p. 543.
Lucina pecten, Philippi, Enum. Moll. Sicil., vol. i. p. 31, pl. iii. fig. 14.
Lucina pecten, Reeve, Conch. Icon., vol. vi. pl. vii. figs. 34 and 35, *a*, *b*.
Lucina reticulata, (Poli) Weinkauff, Conch. Mittelm., vol. i. p. 160.
Lucina obliqua, Reeve, Conch. Icon., vol. vi. pl. viii. fig. 42.

Habitat.—Station 113A, off the island of Fernando Noronha, in 25 fathoms; and Station 33, off Bermuda, in 435 fathoms.

This species is found in many parts of the Mediterranean, on the west coast of France and Portugal, at Madeira, the Canary and Cape Verde Islands, at Senegal, Guinea and St. Vincent, West Indies. *Lucina obliqua*, Reeve, said to be from Chusan, I am unable to distinguish from this species. The sculpture, hinge, and muscular scars are precisely similar, both forms have the same oblique pitted line across the centre of the interior of

the valves, and the form of the specimen figured by Reeve as *Lucina obliqua* is exactly that of the shell figured by Philippi.

Only a few small valves about 4 millimetres in length were dredged off Bermuda. At this young stage they are quite as convex as the adult form, from which they differ in having the margin of the valves crenulated within. The outline and hinge characters are about the same.

Lucina (*Codakia*) *seminula*, Gould (Pl. XIII. figs. 5–5*a*).

> *Lucina* (*Myrtea*) *seminula*, Gould, Proc. Boston Soc. Nat. Hist., 1861, vol. viii. p. 36; Otia Conch., p. 174.

Testa minuta, crassiuscula, paulo obliqua, mediocriter convexa, irregulariter rotundata, ante umbones excavata, alba. Valvæ aliquanto inæquilaterales, impressione radianti utrinque notatæ, costellis concentricis subvalidis aliisque minoribus in interstitiis instructæ. Margo dorsi anticus prope umbones conspicue concavus, posticus declivis, rectiusculus; margo inferior excurvatus, ad latera leviter sinuatus. Lunula parva, profundissima. Cardo validus. Dentes cardinales duo divergentes in valva sinistra, unicus in dextra. Laterales breves, crassi, ab umbonibus æquidistantes. Pagina interna minute rugulosa, ad marginem incrassatum fortiter dentata.

This minute form is rather solid in texture, slightly oblique in outline, irregularly rounded, concave in front of the umbones, straightish but oblique on the hinder dorsal side. It is white, rather inequilateral, with a shallow radiating depression down each side of the valves, which cause the lateral margins to be somewhat truncate or even sinuated. The posterior of these is usually more pronounced than that in front. The sculpture consists of twenty to thirty rather stout and elevated concentric costæ, which gradually become thicker as the shell enlarges, and attenuate at the sides. In the interstices between them are numerous but more slender radiating liræ, which do not, however, cross the others. The lunule, although small, is remarkably deeply excavated beneath the overcurving umbones, each of which is smooth at the bluntish tip. The hinge-plate is strong. There are two primary teeth in the left valve and one in the right, the latter falling between the former, which are divergent. The laterals are strong, short, erect, and about equidistant from the cardinals. The ligament is long, narrow, external, in a groove on the posterior margin just behind the umbones. The interior of the valves under the microscope appears to be minutely rugose. The thickened outer margin is coarsely denticulated, the teeth upon the front and lower margins being a little stronger than those upon the posterior edge, where at times they are more or less obsolete. The pallial line is simple and the muscular scars rather large.

Length $2\frac{1}{2}$ mm., height $2\frac{1}{3}$, diameter $1\frac{2}{3}$.

Habitat.—Station 188, south of New Guinea, in 28 fathoms (Challenger); Hong Kong Harbour (Gould).

There are two or three species which are so closely allied that if a large series of specimens were got together, in all probability it would be difficult to draw any lines of separation. All are very similiar in form, agree in having a strong depression down the hinder side of the valves and a feebler one in front, and differ chiefly in the coarseness of the cancellation of the surface. *Lucina pisum*, Reeve, from Port Essington, is the most strongly sculptured of all, the radiating costæ being few in number, and as coarse or even coarser than the concentric ridges. *Lucina semperiana*, Issel, has more numerous and more slender radiating riblets than the preceding species, and its concentric ridging is of a stronger character than the riblets; and finally, *Lucina seminula*, Gould (judging from a specimen in the British Museum which had been compared with Gould's type), is ornamented with still finer concentric ridges and less conspicuous cross costellæ. All three forms have very deep lunules, especially *Lucina pisum*, and a peculiarly raised posterior dorsal area.

Lucina (*Codakia*) *pisum*, Reeve.

Lucina pisum, Reeve, Conch. Icon., vol. vi. pl. xi. figs. 66, *a*, *b*.
Lucina pisum, H. and A. Adams, Genera Rec. Moll., vol. ii. p. 467.

Habitat.—Station 188, south of New Guinea, in 28 fathoms (Challenger); Port Essington (Jukes in Brit. Mus.); Singapore, in sandy mud, at a depth of 7 fathoms (Cuming).

The radiating costæ in this species are only about eleven in number, very strong, and crossed by about sixteen stout concentric ridges, which are somewhat nodose upon the costæ, and gradually attenuated at both ends, which are devoid of longitudinal ribs. The lunule is small but remarkably deep, and wider than long. The inner edge of the valves is very strongly dentate along the lower margin, and very minutely crenulated at the posterior truncated side.

Lucina (*Codakia*) *levukana*, n. sp. (Pl. XIII. figs. 6–6*a*).

Testa minuta, mediocriter crassa, oblique ovata, inæquilateralis, alba, convexiuscula, lunula profunda instructa, liris tenuibus concentricis, aliisque radiantibus in interstitiis multo tenuioribus ornata. Margo dorsi anticus oblique excavatus, posticus rectiusculus, declivis. Latus anticum latum, rotundatum, posticum angustius. Umbones mediocriter producti, ad apicem incurvati, antice versi. Lunula profunda, margine elevato indistincto circumdata. Dentes cardinales valvæ sinistræ duo crassi, divergentes, subæquales; laterales validi, remoti. Margo valvarum internus minute denticulatus. Ligamentum internum, angustum, in sulco profundo positum.

Of this species only two left valves are at present known. These, although of very small size, are apparently adult, judging from their thickness of structure, the denticulate inner margin, and the strong character of the hinge. It is a species of an oblique ovate or rounded growth, rather strong for so small a form, moderately convex, excavated in the lunular region, and a little depressed down the posterior slope. It is white, somewhat inequilateral, broadly rounded in front, narrower behind. The sculpture consists of strongish, rather elevated concentric riblets somewhat narrower than the interstices between them, which exhibit excessively fine radiating liræ. The beaks are rather large, prominent, curved over towards the front, and not very acute. The lunule is deeply depressed, somewhat indistinctly defined by a raised edge and sculptured by the fine extremities of the concentric ridges. The left valve has two cardinal teeth and the right probably the same number. They are strongish, about equal in size, and diverging. The anterior is erect, beneath, or very slightly in front of, the tip of the umbo and free from the dorsal edge, the posterior being directed backwards, and perhaps a trifle slenderer. The lateral teeth are strongly developed, and about equidistant from the beak. The ligament is totally internal, elongate, narrow, and placed in a deep groove below the dorsal margin behind the posterior cardinal tooth. The inner edge of the valves, with the exception of that portion occupied by the hinge and lateral teeth, is minutely denticulated. The muscular scars are fairly well defined, the pallial line simple, and the inner surface of the valves dull, under the microscope appearing rather rugose.

Length $2\frac{2}{3}$ mm., height $2\frac{1}{4}$, diameter $1\frac{3}{4}$.

Habitat.—Off Levuka, Fiji Islands, in 12 fathoms.

This is a remarkable little shell on account of its obliquity, the expanded anterior end, the strong hinge, and denticulate margin of the valves. It differs in the last mentioned character from *Lucina quadrata*, Angas, a species found at Port Jackson which has a somewhat similar form and the same hinge-characters, but is differently sculptured externally.

Lucina (*Codakia*) *congenita*, n. sp. (Pl. XIII. figs. 7–7*a*).

Testa *Lucinæ levukanæ* similis, sed minus obliqua, liris concentricis validioribus, radiantibus fortioribus, lunula breviori instructa, margine valvarum interno crassiori, denticulis majoribus munito.

This species bears considerable resemblance to *Lucina levukana*, but may be distinguished by its less oblique form, the anterior side being less produced and not so expanded. The posterior side of the valves displays more of a depression, the lunule is shorter, and consequently the front dorsal margin is more briefly excavated. The umbones in this species are hardly so peaked, the concentric liræ a good deal thicker

and fewer in number, and the radiating sculpture is also of a coarser character. The constitution of the hinge is very similar, but in *Lucina levukana* the anterior lateral teeth are more remote from the cardinals than in this species. The edges of the valves of the latter are considerably thickened, and the denticles on the inner margin are fewer and stouter than in the Fijian form.

Length $3\frac{1}{2}$ mm., height $3\frac{1}{2}$, diameter $2\frac{1}{2}$.

Habitat.—Station 185B, east of Cape York, North Australia, at a depth of 155 fathoms; coral sand.

Lucina (*Codakia*) *hawaiiensis*, n. sp. (Pl. XIII. figs. 8–8*a*).

Testa inæquilateralis, oblongo-rotundata, paulo obliqua, ante umbones excavata, antice late curvata, postice angustior, alba, lamellis tenuibus parum elevatis costellisque crassioribus radiantibus minus elevatis cancellata. Margo dorsi anticus primo excavatus, leviter declivis, posticus brevior, magis obliquus, rectiusculus; umbones parvi, leviter prominentes, incurvati, antrorsum versi. Lunula parva, subprofunda, pellucida. Dentes cardinales duo in valva sinistra, unicus in dextra validus, triangularis, medianus. Laterales fortes, subæquidistantes, posticis paulo propius umbones positis. Ligamentum externum, supra marginem locatum. Pagina interna alba, cicatricibus magnis notata, ad marginem denticulata.

A single specimen and an odd valve, which probably do not represent the adult state of the species, are all that are at present known.

The shell is rather thin, having a semipellucid appearance, of an oblong irregularly rounded form, fairly convex, rather inequilateral, and somewhat oblique. The posterior dorsal margin is short, almost straight, and rather sloping, the anterior being longer, less oblique, concave at first, and then rounding into the broadly curved anterior end, which is wider than the hinder extremity. The beaks are small, smooth, opaque white, incurved over the small deepish pellucid lunule. The sculpture consists of slender slightly elevated concentric lamellæ which pass over less raised but thicker radiating costellæ. The hinge is composed of two cardinal teeth in the left valve and one in the right, and a small ligament placed in a narrow groove on the hinder dorsal edge in each valve. All the cardinals are strongish, those in the left valve being divergent, and separated by a triangular pit, which receives the strong central tooth of the right. The lateral teeth, too, are thickish and well developed, and moderately remote from the centre of the hinge-plate, the anterior being a little more distant than the posterior. The inner margin of the valves is rather coarsely dentate, the muscular scars are large, and the pallial impression is simple.

Length $3\frac{1}{2}$ mm., height $2\frac{2}{3}$, diameter $2\frac{1}{3}$.

Habitat.—Dredged in 40 fathoms among the reefs off Honolulu, Sandwich Islands.

In form this species is somewhat like *Lucina quadrata*, Angas, but has a different style of sculpture, the concentric ridges being further apart, the radiating liræ more distinct, and the inner margin of the valves consequently denticulate. The hinge-characters are the same in both.

Lucina (*Codakia*) *fijiensis*, n. sp. (Pl. XIII. figs. 9–9*a*).

Testa paulo obliqua, irregulariter rotundata, mediocriter convexa, alba, ante umbones aliquanto excavata, postice subdepressa, liris tenuibus numerosis radiantibus aliisque concentricis gracilioribus magis remotis cancellata. Dens cardinalis unicus in valva dextra conicus, medianus; posticus lateralis erectus, intra marginem situs, anticus nullus. Ligamentum internum obliquum, profunde infra marginem dorsalem posticum locatum. Pagina interna haud nitida, punctulata, ad marginem subtiliter denticulata. Cicatrices magnæ; pallii sinus simplex.

This species is a little oblique, more or less rounded, moderately convex, white, exhibiting a small lunular excavation and a slight depression down the posterior side at a little distance from the margin. The sculpture consists of numerous very fine radiating liræ, which are crossed by others still more slender and rather further apart. These towards the hinder side are, except in the faint depression, a little lamelliform. The umbones are smooth, moderately prominent, curved over towards the anterior side, and not very acute. There is in the right valve a single conical erect cardinal tooth situated just below the tip of the beak, having on each side a deepish pit which apparently indicates the presence of two cardinals in the left valve, at present unknown. On the posterior side there is a moderately elongate lateral tooth, separated from the outer margin by a deepish furrow. The ligament, which is internal, is deeply located in a long narrow groove running obliquely from near the apex beneath the hinder dorsal line. The inner surface of the valve is dull, without gloss, exhibiting a considerable number of minute shallow punctures not arranged apparently in any particular order. The outer margin is finely denticulated, the number of teeth being nearly one hundred. The muscular scars are rather large and the pallial line simple.

Length $5\frac{1}{3}$ mm., height 5, diameter 4.

Habitat.—Off Levuka, Fiji Islands, in 12 fathoms.

Lucina (*Codakia*) sp. juv.

Habitat.—Amboina, in 15 to 20 fathoms.

As but a single valve, $2\frac{1}{2}$ mm. in length, was obtained, which has the appearance of being but the young state of some larger species, I refrain from naming it, although

apparently distinct from any known form. It is rather convex, rounded and concave in front of the umbo, where there is a small deepish lunule. It is sculptured with about fifteen flatly rounded radiating ribs, which are absent down each side, and concentric elevated lines of growth. There is a single cardinal tooth in this right valve, and a short, erect, subequidistant lateral on each side ; the lower margin is rather strongly denticulated where the ribs terminate, but smooth at the sides where the costæ are wanting.

Lucina (*Loripes*) *desiderata*, n. sp. (Pl. XIII. figs. 10–10*a*).

Testa parva, tenuis, inæquilateralis, alta, postice radiatim impressa, antice profunde lunulata, albida, concentrice tenuissime lirata, liris numerosis sublamelliformibus prope lunulam et marginem dorsalem posticum cristatis. Margo dorsi anticus brevis, valde excavatus, posticus longior, rectiusculus, vel parum convexus. Latus anticum regulariter curvatum, posticum ad terminum impressionis leviter sinuatum. Umbones parvi, acuti. Lunula elongata, lævis, conspicue excavata, areaque postica, angusta, lævis, valde impressa.

This little species is higher than long, somewhat inequilateral, moderately convex, thin, white, and marked with a shallow radiating depression down the posterior side, producing a faint indentation or sinuation in the outline, which, along the lower portion and in front, is regularly circularly curved. The sculptures consists of numerous very fine thin concentric liræ, which, especially towards the ventral margin, become somewhat lamelliform, and towards the lunule and hinder dorsal slope are elevated into small, thin, dentiform projections. The lunule is rather large, smooth, and very deep, and defined by sharp edges. The area is long, narrow, also deepish and circumscribed by acute margins. The beaks are small, sharp, well-curved over the lunule, and considerably in front of the middle. The left valve has two small divergent cardinal teeth, separated by a triangular pit, which receives a corresponding tooth in the right valve. The internal ligament is in a deepish groove just within the dorsal margin behind the teeth. The inner surface, owing to the thinness and semitransparency of the valves, exhibits the concentric ornamentation of the exterior, and towards the lower part is somewhat indistinctly radiately substriated.

Length $3\frac{1}{3}$ mm., height $3\frac{2}{3}$, diameter $2\frac{1}{3}$.

Habitat.—Station 188, south of New Guinea, in 28 fathoms ; green mud.

This is a small species, resembling in its radiating depression some of the typical forms of *Cryptodon*.

Lucina (*Loripes?*) *jacksoniensis*, n. sp. (Pl. XIII. figs. 11–11*b*).

Testa globosa, rotundata, tenuis, subæquilateralis, albida vel dilute fusco tincta, incrementi lineis confertis striisque numerosis tenuissimis sculpta. Lunula parva, haud

profunda, lanceolata. Umbones parvi, nivei, paulo prominentes, antrorsum versi. Cardo dente unico conico infra apicem in valva dextra et duobus in sinistra instructa, et margo posticus dorsalis valvæ dextræ dente laterali elongato, haud conspicuo munitus. Ligamentum internum magnum, obliquum, in sulco infra marginem locatum. Pagina interna haud nitida, subrugose radiatim striata, margine exteriori minute crenulato.

This species is thin, rather globose, about equilateral, rounded, whitish, and, judging from the single specimen under examination, somewhat tinted near the central portion of the valves with pale brown. It is slightly glossy, and sculptured with fine concentric lines of growth and equally fine radiating striæ, which are almost obsolete down each side and more or less indistinct near the middle of the valves, and entirely absent near the umbones. The anterior dorsal margin is oblique, and a little concave by reason of the small, shortly lanceolate and slightly sunken lunule. The beaks are small, smooth, white, only a very little elevated, and curve over towards the front. The hinge is composed of a single cardinal tooth in the right valve which fits in between two in the left, of which the anterior is the larger, and a narrow insignificant lateral in the right, near but distinct from the posterior dorsal edge, which is received by a corresponding groove in the other valve. The ligament is rather large, entirely internal, and placed in an oblique furrow, extending from the apex not quite to the end of the lateral teeth. The interior has very little gloss, and is rather strongly radiately striated and marked with numerous shallow punctures, neither being met with beyond the pallial line. The muscular scars are large, and the inner margin of the valves minutely crenulated.

Length $9\frac{1}{2}$ mm., height 9, diameter $6\frac{2}{3}$.

Habitat.—Port Jackson, New South Wales, in 6 to 15 fathoms.

This species is larger than *Lucina parvula*, Gould, also found at this locality, more finely radiately sculptured, and has the inner edge of the valves more delicately notched.

Lucina (*Loripes?*) *gordoni*, n. sp. (Pl. XIII. figs. 12–12*a*).

Testa parva, modice convexa, rotundata, æquilateralis, alba, lineis incrementi tenuibus elevatus striisque radiantibus obsoletis sculpta: margo dorsi anticus leviter obliquus, parum excavatus, posticus rectiusculus, horizontalis. Latus anticum regulariter arcuatum, posticum obtusius. Umbones parvi, acuti, paulo prominentes. Dentes cardinis in valva sinistra duo divergentes inæquales, antico majori; margo posticus dente laterali parvo instructus. Ligamentum internum angustum, in sulco profundo obliquo situm. Pagina interna haud nitida, plus minusve radiatim substriata, margine minute crenulato circumdata.

Of this species only a single left valve is at present known. It is roundish, white, about equilateral, moderately convex, not very solid, and sculptured with fine elevated concentric lines (which are scarcely large enough to be termed lamellæ) crossed by numerous not very apparent radiating substriæ. There is a slight narrow lunular depression, causing the anterior dorsal slope to be faintly concave. The hinder margin is short, straight, and hardly at all oblique, rounding off somewhat squarely into the side margin, which is more obtuse and less curved than the anterior side. The umbo is small, peaked, curves over towards the front, and rises a little above the hinge-line. In this valve there are two distinct, divergent, cardinal teeth, which are unequal in size, the front one being more than double the size of the other, and obliquely sloping towards the anterior end. There is a not very strongly developed posterior lateral tooth, separated from the outer margin by a shallow groove, which, no doubt, receives a corresponding tooth in the other valve. The ligament is totally internal and situated in a deep, narrow, oblique furrow, beneath the hinder dorsal margin. The interior is dull, with the exception of that portion of the surface outside the pallial line which is glossy. Towards the middle there are traces of radiating striæ, and the outer edge is very finely denticulated.

Length 5 mm., height $4\frac{1}{2}$, probable diameter of the complete shell $2\frac{2}{3}$.

Habitat.—Off Levuka, Fiji Islands, in 12 fathoms.

This species closely resembles *Lucina jacksoniensis*, but is less distinctly radiately striated.

Cryptodon, Turton.

This genus was founded in 1822 by Turton[1] for the reception of the *Tellina flexuosa* of Montagu. It is considered by some authors identical with *Axinus* of Sowerby. If this really be the case the latter name should be adopted, as it was published a year before *Cryptodon*. It appeared in the fourth volume of the Mineral Conchology, which bears on the title-page the date 1823. This, however, only refers to the completed volume, for this work was published in parts, and that containing plate 315, on which the type (*Axinus angulatus*) is figured, was issued in 1821. Both Agassiz[2] and Herrmannsen[3] quote the date of the volume as that of the publication of this genus, and no doubt this has misled Messrs. Adams and Chenu into adopting the name proposed by Turton.

As far as I can ascertain, the hinge of *Axinus angulatus* has never been described, for the shell associated with it by Nyst[4] seems to me distinct.

Such being the case, I prefer employing the name *Cryptodon*, for, although

[1] Conch. Inst. Brit. Dithyra, p. 121.
[2] Nomen. Zool., Index universalis, p. 42, Mollusca, p. 10.
[3] Indicis gen. malacol. prim., vol. i. p. 100.
[4] Coq. et Polyp. foss. terr. tert. Belgique, p. 140.

externally *Acinus angulatus* appears congeneric, it is possible that the hinge may be differently constructed.

Cryptodon watsoni, n. sp. (Pl. XIV. figs. 1–1*a*).

Testa tenuis, paulo inæquilateralis, anguste lunulata, mediocriter globosa, rotundata, superne lata, subquadrata, alba, incrementi lineis tenuibus (hic illic fortioribus) striata, striis minutis radiantibus irregularibus sculpta. Margo dorsi anticus parum declivis, leviter concavus, posticus rectiusculus, fere horizontalis. Latus anticum aliquanto angustatum, obtuse subnasutum, posticum multo altius, late curvatus. Margo ventris regulariter curvatus, antice oblique ascendens. Umbones parvi, mediocriter acuti, paulo antemediani, parum supra marginem producti. Cardo edentulus. Ligamentum elongatum, angustum, in sulco pone umbones intra marginem positum. Pagina interna radiatim substriata, antice lineis elevatis paucis radiatim curvantibus instructa. Cicatrices inæquales, postica subpyriformi, antica irregulari, obliqua, partim intra lineam pallii producta.

This species is white, moderately convex, rather thin, broad above, somewhat shouldered on both sides, curved beneath. It is much higher behind than in front, where, through the upcurving of the ventral margin, it has a faintly nasute appearance. The valves are slightly inequilateral, the beaks, which are small, only a little elevated above the dorsal line and not very acute, being situated somewhat in advance of the middle. They also present a narrow lunule which is elevated along the centre, then somewhat depressed. The sculpture consists of fine concentric lines of growth, some of which, at intervals, are more conspicuous than the rest, as if marking periodical cessation of growth. In addition the surface exhibits a fine but rather irregular radiate striation. The front dorsal margin is very slightly concave and a trifle oblique. The posterior is almost rectilinear and nearly horizontal. The ventral outline is regularly curved and much ascending anteriorly. The hinge is toothless and the ligament must be only partially visible externally, being contained in a narrow groove within the hinder dorsal margin, of which it occupies rather more than half the length. The inner surface of the valves is not particularly glossy, radiately substriate, and marked in front with one or two slender elevated lines curving from the beaks to the anterior muscular scar. This is of an irregular elongate form, almost parallel with the ventral margin, and falls partly within the simple pallial line. The hinder scar is perhaps a trifle larger and somewhat pear-shaped.

Length 20 mm., height 17½, diameter 11.

Habitat.—Station 219, off the north of the Admiralty Islands, at a depth of 150 fathoms; coral mud.

This is a less convex species than *Lucina bullula*, rather longer, more pouting in front, more equilateral, and has a much longer lunule. The radiating sculpture also is more distinct, the ligamental groove broader, and the anterior muscular scar twice or three times as broad.

Cryptodon bullulus (Reeve).

Lucina bullula, Reeve, Conch. Icon., vol. vi. fig. 35.

Habitat.—Amboina, in 15 to 20 fathoms (Challenger); Port Essington (J. B. Jukes in Brit. Mus.).

The distribution of this species has not been previously recorded. The figure in the Conchologia Iconica does not represent the adult form of it, for in the British Museum there is a specimen from Port Essington which is 17 mm. long, 15 high, and 12 in diameter, and the single left valve from Amboina is even a little larger.

This is a very thin species, slightly lunuled, considerably convex, rather shouldered above and prominently curved along the lower margin. It is sculptured with fine lines of growth and indistinct traces of radiating substriæ. The toothless hinge-line is very thin, and consequently the longish ligamental groove is very narrow. The anterior muscular impression is remarkably narrow, and descends obliquely within the pallial line.

Cryptodon moseleyi, n. sp. (Pl. XIV. figs. 2–2*a*).

Testa tenuissima, ovata, valde inæquilateralis, mediocriter convexa, semipellucido-alba, haud nitida, incrementi lineis tenuibus striata, epidermide tenui pallide olivacea prope marginem induta. Margo dorsi ante umbones elevatus, arcuatus, postice obliquus, rectiusculus. Margo ventralis paulo curvatus, latum posticum versus oblique ascendens. Umbones parvi, vix supra marginem producti, post medium siti. Cardo edentulus. Ligamentum internum obliquum, pone apicem locatum. Pagina interna subnitens, plus minusve radiatim substriata.

This is an excessively fragile shell, broadly ovate, very inequilateral, the anterior side being both longer and broader. It is moderately convex, of a dirty white colour, not glossy on the surface, and clothed to some extent with a very thin pale olive epidermis, especially towards the dorsal margin. The sculpture consists of fine lines of growth, some here and there being rather more conspicuous than the rest. The front dorsal margin is arched and higher than the beaks, the posterior, on the contrary, being shorter, straightish, and obliquely sloping. The anterior end is regularly semicircularly curved, the posterior rather more obtusely arcuate, and the curve of the ventral margin gentle and slowly ascending behind. The umbones are small, scarcely elevated above

the hinge-line, slightly eroded at the tip, and situated at about three-eighths of the entire length from the hinder extremity. The hinge-plate is absolutely toothless, and only very slightly thickened on both sides. The internal ligament is small, yellow, and, starting from beneath the tip of the beaks, extends about a millimetre backwards. The interior of the valves is moderately shining, feebly substriated in a radiating direction, and, under the microscope, appears to be minutely rugose. The muscular scars and pallial impression are too indistinct for description.

Length 16 mm., height 12, diameter 6.

Habitat.—Station 133, South Atlantic, in 1900 fathoms; Globigerina ooze.

This shell is unusually thin for a Lucinid, and the hinge is very delicate, as might be expected in one from such a great depth.

? *Cryptodon barbatus* (Reeve).

Lucina barbata, Reeve, Conch. Icon., vol. vi. pl. iv. figs. 16, *a*, *b*.

Habitat.—Station 33, off Bermuda, in 435 fathoms; coral mud.

A single left valve, all that was obtained, agrees exactly with this species in form, the toothless character of the hinge, the position of the ligament, the form of the muscular scars, and in the small deep lunule. The external concentric lines of growth are, however, rougher to the touch and apparently more raised, and the shallow depression down the posterior side is a little nearer the dorsal margin.

Cryptodon falklandicus, n. sp. (Pl. XIV. figs. 3–3*a*).

Testa rotundata, mediocriter convexa, paulo inæquilateralis, alba, cretacea, epidermide tenui flavescente induta, concentrice striata. Valvæ tenues, sulco postico lato radianti haud profundo aratæ. Margo ligamenti leviter arcuatus, anticus declivis, rectiusculus. Latus anticum ad extremitatem rotundatim subangulatum, posticum breviter truncatum. Pagina interna alba, parum nitida, plus minusve rugosa. Cicatrix antica magna, elongata, irregularis, posterior minor, brevior.

This species is a trifle longer than high, roundish, moderately convex, thin, white, of a chalky appearance, and covered more or less with a thin yellowish epidermis. It is somewhat inequilateral, the beaks being situated a little in advance of the centre, and striated rather roughly by the lines of growth. The valves exhibit a broadish shallow depression down the posterior side, which produces a short truncated extremity to the margin. There is also a faint depression on the opposite side, marking off an elongate cordate lunular space. The posterior or ligamental portion of the dorsal margin is a little curved and less oblique than the anterior, which is straightish, and joins the upcurving ventral outline almost in a rounded angle. The hinge-line is thickened slightly to

support the strongish ligament, also just in front of the apices. The interior of the valves is opaque-white, hardly at all glossy, and rather rough through being somewhat punctate and irregularly striate. The anterior muscular impression is very long, with a jagged outline, and falls partly within the subpunctate pallial line. The hinder scar is much smaller, and somewhat coarsely striated.

Length 15½ mm., height 14½, diameter 8.

Habitat.—Station 316, off the Falkland Islands, in 3 to 5 fathoms; mud.

Lucina plicifera (A. Adams), from Borneo, is somewhat like this species in form, having a radiating depression down each side, but is more strongly concentrically ridged, and has a single anterior lateral tooth in each valve, whilst *Cryptodon falklandicus* is totally edentate.

Cryptodon rufolineatus, n. sp. (Pl. XIV. figs. 4–4*a*).

Testa inæquilateralis, modice convexa, rotundata, albida, apices versus dilute rufescens, lineis pallide rufis paucis radiata, sublævigata, striis incrementi tenuibus sculpta, antice infra umbones sublunulata. Pagina interna dilute rufescens, haud nitida, radiatim substriata. Cardo tuberculo parvo in utraque valva instructus; ligamentum angustum, parvum, in sulco infra marginem dorsalem situm.

This is a roundish species, but rather longer than high, and narrower and more pointed in front than behind. It is moderately globose, somewhat inequilateral and glossy, whitish, marked at intervals with narrow subpellucid zones, reddish towards the umbones, and ornamented with a few pale red rays. The front dorsal margin is faintly concave and sloping, the posterior being longer, nearly straight, and less oblique. There is a slight lunular depression, which is not, however, clearly circumscribed. The hinge is almost toothless, there being only a small tubercular prominence beneath the beak, probably in both valves, although I have but a single left valve from which to judge. The ligament is totally internal, small, and located in a narrow groove under the posterior dorsal edge. The interior of the valves is not glossy, except near the outer flattish margin. It is faintly tinged with red near the central part, and exhibits, in a slight degree, the external rays, and is radiately substriated. The front muscular scar is rather large, and, as usual, falls within the pallial line.

Length 6 mm., height 5, supposed diameter of the perfect specimen 3.

Habitat.—Off Levuka, Fiji, in 12 fathoms.

This is a pretty little species, judging from the single valve at hand, which, however, is probably not full grown, and remarkable for being rayed with colour, a very unusual feature in shells belonging to the Lucinidæ.

Cryptodon luzonicus, n. sp. (Pl. XIV. figs. 5–5*a*).

Testa parva, tenuis, inæquilateralis, globosa, obliqua, rotunde subquadrata, alba, epidermide tenuissima lutescente induta, concentrice subdistanter graciliter lirata. Umbones nivei, nitidi, prominentes, incurvati, antrorsum involuti. Cardo fere edentulus, valva dextra tuberculo minuto dentiformi sub apicem instructa. Pagina interna nitida, radiatim tenuissime striata, margine simplice circumdata.

This species is very thin and fragile, rather convex, and of an oblique growth, the anterior side being produced so as to give the shell an inequilateral aspect. The outline is roundish-square, but interrupted above by the prominent umbones. The front side is higher and less curved than the posterior, and the dorsal line on the anterior side is longer and not so sloping as the hinder margin. The shell is pure white, but clothed to a great extent with a thin yellowish slightly fibrous epidermis. It is sculptured with numerous fine concentric liræ, which are not nearly so broad as the interstices between them, and gradually become obsolete upon the smooth snow-white beaks, which are rather prominent, glossy, well curved over towards the front, the apices, however, having about a central position on the dorsal line. In addition to the liræ, the entire surface of the valves has the appearance, under a strong lens, of being minutely dotted all over with small pellucid spots. The hinge is almost entirely destitute of teeth, there being only a very small tubercle on the hinge-line of the right valve immediately under the tip of the beak. The ligament is placed on the hinge-line between the valves, so that it is partly external and partly concealed. The interior of the valves is glossy but very finely striated in a radiate direction, and the outer margin is simple and smooth. The scars and pallial line are indistinct.

Length $6\frac{1}{2}$ mm., height $6\frac{1}{2}$, diameter 5.

Habitat.—Station 205, off the west coast of the Island of Luzon, Philippines, in 1050 fathoms; blue mud.

Cryptodon flexuosus (Montagu).

Tellina flexuosa, Montagu, Test. Brit., p. 72.
Lucina flexuosa, Reeve, Conch. Icon., vol. vi. pl. xi. fig. 62.
Lucina flexuosa, Forbes and Hanley, Brit. Moll., vol. ii. p. 54, pl. xxxv. fig. 4.
Axinus flexuosus, Jeffreys, Brit. Conch., vol. ii. p. 247, and vol. v. p. 179, pl. xxxiii. fig. 1.
Axinus flexuosus, Jeffreys, Proc. Zool. Soc. Lond., 1881, p. 701.
Axinus flexuosus, G. O. Sars, Moll. Reg. Arct. Norv., p. 59, pl. xix. figs. 4, *a*, *b*.
Cryptodon flexuosus, Turton, Conch. Dithyra, p. 121, pl. vii. figs. 9, 10.

Habitat.—Station 75, of Fayal, Azores, in 450 fathoms; volcanic mud.

Only a single valve which undoubtedly belongs to this species was dredged. It belongs to the variety named *polygona*.

For the distribution of this species, see Dr. Gwyn Jeffreys' paper.[1]

[1] *Proc. Zool. Soc. Lond.*, 1881.

Cryptodon croulinensis (Jeffreys).

Clausina croulinensis, Jeffreys, Ann. and Mag. Nat. Hist., 1847, vol. xx. p. 19; *op. cit.*, 1858, vol. ii. p. 122, pl. v. figs. 2, *a–c*.
Axinus croulinensis, Jeffreys, Brit. Conch., vol. ii. p. 250, vol. v. p. 180, pl. xxxiii. fig. 2.
Axinus croulinensis, Jeffreys, Proc. Zool. Soc. Lond., 1881, p. 703.
Axinus croulinensis, G. O. Sars, Moll. Reg. Arct. Norv., p. 62, pl. xix. fig. 8.

Habitat.—Station VIII., off Canary Islands, in 620 fathoms; Station 33, off Bermuda, in 435 fathoms; and Station 78, off the Azores, in 1000 fathoms.

A single specimen from the first locality, one valve only from the second, and about a dozen valves from Station 33, is all that was obtained. That from the Canary Islands and the Bermudan valves are hardly so obliquely expanded in front as examples from the Shetland Islands with which I have compared it, and the posterior impressed rays are so much stronger that I feel doubtful whether they may not be specifically distinct.

This species has been found at the island of Skye, the Shetlands, in deep water in the Atlantic, off the Norwegian coast, in the Mediterranean and the Adriatic. Also found fossil in Pliocene and Post-tertiary formations (*teste* Jeffreys).

Cryptodon incrassatus, (Jeffreys), var.

Axinus incrassatus, Jeffreys, Ann. and Mag. Nat. Hist., 1876, vol. xviii. p. 492.
Axinus incrassatus, Jeffreys, Proc. Zool. Soc. Lond., 1881, p. 703, pl. lxi. fig. 7.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

The few odd valves from the above locality have already been referred to this species by Dr. Gwyn Jeffreys in the Proceedings of the Zoological Society. Not having had an opportunity of comparing them with typical examples, I cannot give any positive opinion respecting their identity. Judging, however, from the description in the Annals and the figure in the Proceedings, I feel no hesitation in pronouncing them a well-marked variety, and am almost inclined to hold them specifically distinct. They are rounder and less oblique in form, and consequently more equilateral. The hinge-plate cannot be described as "remarkably thick on both sides," the posterior side in the right valve is not crenulated, nor does the anterior side correspond with the figure. There is but one right valve in the collection, and in this the hinge-line is produced immediately beneath the beak, the minute projection (it can scarcely be termed a tooth) fitting in under the tip of the umbo in the other valve. The front portion of the hinge-plate in this valve is thin, whilst in the left it is a little thickened. The posterior dorsal line in

the right valve is slender at first, then becomes broader below the first angle, or, in other words, along the truncation, with a narrow groove along the middle which receives the acute edge of the left valve. In the latter the margin is most expanded at the upper angle. There does not appear to be any trace of a ligamental groove.

Cryptodon sp.

Habitat.—Station 344, off Ascension Island, South Atlantic, in 420 fathoms; volcanic sand.

As but a single minute valve, only about a millimetre in length, was obtained, I refrain from giving more than a mere record of its discovery. It doubtless is the young state of a probably new form approaching *Cryptodon croulinensis*, but rather less oblique, rounder, and not so peaked at the umbones.

Cryptodon marionensis, n. sp. (Pl. XIV. figs. 6–6*a*).

Testa parva, tenuissima, albida, subpellucida, irregulariter rotundata, mediocriter convexa. Valvæ impressionibus duabus radiantibus haud profundis postice notatæ, incrementi lineis striatæ, sculptura peculiari quasi microscopice subpunctata undique ornatæ. Margo dorsi ante umbones leviter concavus, posticus vix convexus. Latus anticum rotundatum, posticum haud profunde bisinuatum. Umbones parvi, acuti, mediani, antrorsum versi. Cardo edentulus, sed linea cardinis in valva sinistra infra apicem paulo incrassata et producta. Ligamentum omnino internum, in sulco angusto infra marginem dorsalem situm.

Length 4 mm., height $4\frac{1}{2}$, diameter 3.

Habitat.—Prince Edward and Marion Islands, in 100 to 150 fathoms.

This species is the southern form of *Cryptodon gouldii*, Philippi, and *Cryptodon flexuosus*, Montagu, both of which species it closely resembles. It is, however, flatter, and perhaps a trifle longer than either, and the lower of the two furrows, or rather depressions, down the hinder side of the valves is rather broader and certainly not so deep as in *Cryptodon flexuosus*. The ligament also in the present species appears to be set in a somewhat deeper groove, and the prominence of the hinge-line beneath the umbo in the left valve is more marked than in either of the two species referred to. If these differences, slight as they are, prove constant, I think it right they should be held of specific importance.

Cryptodon sp.

Habitat.—Station 23, off Sombrero Island, West Indies, in 450 fathoms.

A single right valve of a small species was dredged at this locality, which appears to be distinct from any previously described. It is somewhat like *Cryptodon croulinensis* in size and form, but does not exhibit any depression down the posterior side.

Family UNGULINIDÆ.

Diplodonta, Bronn.

Diplodonta subgranulosa, n. sp. (Pl. XIV. figs. 7–7*a*).

Testa subinflata, inæquilateralis, alba, antice angustata, acute rotundata, postice longe latior, concentrice leviter striata, ubique minute rugosa vel subgranulata. Umbones parvi, acuti, leviter involuti. Margo dorsi posticus subhorizontalis, rectiusculus, anticus valde obliquus, levissime curvatus. Margo ventris arcuatus, antice multum adscendens. Margo dorsalis antice breviter, haud profundeque intus sulcatus. Dens cardinis duplex valvæ sinistræ infra umbonem situs, profunde fissus, valde erectus; dens posticus tenuis, lamellaris, obliquissimus. Ligamenti fossa intra marginem locata.

This species is rather convex, considerably inequilateral, much narrower in front than behind, white, not glossy, exhibiting fine concentric lines of growth, and sculptured throughout with a very fine subgranulation. The dorsal outline is scarcely curved on either side, the hinder portion being horizontal and the anterior part very oblique. The front extremity is sharply rounded, whilst the opposite side is much more broadly curved, forming at the upper part an obtusely rounded shoulder. The umbones are small, but very little raised above the hinge-line, acute, somewhat incurved and directed forwards. The hinge-plate beneath the beaks is broadish, so that the teeth do not project beyond it. The double one in the left valve is thick, prominent, triangular, deeply cleft at the top, and falls perpendicularly immediately beneath the apex of the beak. The posterior tooth is very slender and oblique, and the ligamental groove is within the outer margin, so that scarcely any portion of the ligament itself would be visible exteriorly. Besides this groove the hinder margin exhibits only the faintest furrow, but the anterior side is more distinctly sulcate, the groove, however, being short and shallow.

Length $5\frac{2}{3}$ mm., height $4\frac{3}{4}$, diameter $3\frac{1}{2}$.

Habitat.—Station 208, Philippine Islands, in 18 fathoms: blue mud.

The form and the surface, which has a minutely shagreened appearance, are the characteristics of this species.

Diplodonta sculpta, n. sp. (Pl. XIV. figs. 8–8*a*).

Testa subcompressa, alba, subpellucida, inæquilateralis, concentrice exillissime striata, lineis elevatis subdistantibus opacis concinne ornata. Umbones parvi, parum prominentes, in $\frac{3}{7}$ longitudinis positi, paulo prominuli. Margo dorsi utrinque rectiusculus, antice intus anguste prelongateque sulcatus, oblique descendens, postice magis horizontalis. Latus posticum altum, late arcuatum, superne indistincte subangulatum, anticum acutius rotundatum. Ventris margo late curvatus. Cardo angustus. Dens duplex profunde fissus, intus projectus. Ligamenti sulcus parvus, angustus, supra marginem situs.

This species has a rather compressed shell. It is thin, semitransparent white, finely striated with the lines of growth, and ornamented at intervals with thread-like white ridges or liræ which, under a lens of low power, have the appearance of concentric scratches. It is somewhat inequilateral, and a little longer than high. The hinder dorsal outline is somewhat oblique and almost rectilinear, the anterior being equally straight, but more sloping. The lower margin is broadly arcuate, and ascends rather more anteriorly than behind. The posterior end is broader or higher, and more gently curved than the front, and at the upper part forms an indistinct obtuse angle with the dorsal margin. The umbones are very small, acute, a trifle antemedian, and only a little elevated above the hinge-plate. This is narrow, and but slightly developed on either side of the cardinal teeth. Of these the double triangular one is remarkable, is deeply slit at the top and projects within the valve beyond the hinge-plate. The other tooth in both valves is narrow, divergent, and not united at the upper extremity to the larger tooth. The anterior dorsal margin has a shallow groove within in both valves, which is peculiar as it reaches to the middle of the lateral outline. The hinder margin is not grooved, but only has a furrow upon the border for the reception of the ligament, which may be described as subexternal. The muscular impressions are scarcely observable, and too indistinct for description.

Length 7 mm., height $6\frac{1}{2}$, diameter $3\frac{1}{2}$.

Habitat.—Station 187, off Cape York, North Australia, in 6 fathoms; coral mud.

Its compressed form, the prolonged shallow groove within the front dorsal and lateral margins, and the very deeply-fissured tooth projecting within beyond the hinge-plate, are the most prominent features distinguishing this species.

Diplodonta corpulenta, n. sp. (Pl. XIV. figs. 9–9*a*).

Testa parva, globosa, tenuis, rotundata, subdiaphana, vix inæquilateralis, concentrice tenuiter striata et subdistanter gracillime sublirata. Umbones minuti, parum prominentes, paulo ante medium collocati. Margo dorsalis antice curvatus, subhorizontalis, postice

oblique leviterque arcuatus; ventris margo aliquanto late arcuatus. Latus anticum altum, obtusum, posticum paulo acutius rotundatum. Dentes cardinis in valva sinistra normales, antico bifido, crasso, postico gracili, elongato. Margo dorsi ante umbonem intus profunde effossus, supra dentem bifidum levissime emarginatus vel depressus. Ligamenti sulcus haud profundus, marginalis, angustus. Impressiones musculorum magnæ, elongatæ.

The shell of this small species is thin, rather globose, rounded, a little longer than high, concentrically finely striated, and exhibits at short distances minute elevated ridges or liræ. It is white, slightly glossy, and inequilateral, the anterior side being a trifle shorter than the posterior. The front dorsal margin is very slightly concave near the beaks, then somewhat excurved, rising a little before commencing the descent to the side. The hinder margin is feebly arcuate, and slopes more obliquely than the anterior. The ventral outline is broadly curved, and forms with the dorsal margin a sharper curve behind than in front. The umbones are very small, only a very little elevated above the hinge-plate, not very acute at the tip, and are situated a trifle in advance of the centre. In the left valve the front tooth is stout, strongly grooved at the top, falls immediately beneath the tip of the beak, and inclines but very slightly towards the front. The hind tooth is very slender and oblique, elongate, and is almost connected with the anterior tooth at the upper end, and at the lower extremity runs into the inner edge of the hinge-plate, being separated from the other tooth by a deep triangular pit. The anterior half of the hinge-plate is just a trifle broader than the posterior, remarkably deeply and widely grooved. The hinder portion is also deeply channelled, a narrow elongate slip behind the umbo being partitioned off for the ligament, which would scarcely be visible externally. The muscular scars are elongate and very large.

Length $4\frac{1}{2}$ mm., height $4\frac{1}{3}$, diameter 3.

Habitat.—Station 187, west of Cape York, North Australia, in 6 fathoms; also Station 188, a little farther west of Cape York, at a depth of 28 fathoms.

This species is distinguished from *Diplodonta subglobosa* by its more ventricose form. The anterior end is higher and more obtuse than the posterior, whilst in the other species, on the contrary, the latter extremity is the more broadly arcuate. The hinge-plate, too, in the present species is broader and more deeply grooved, the posterior tooth in the left valve is longer and more oblique, the ligamental furrow is narrower, and the double tooth is not so deeply bipartite as in the following species.

Diplodonta subglobosa, n. sp. (Pl. XIV. figs. 10–10*a*).

Testa parva, rotundata, subglobosa, tenuis, haud nitida, striis concentricis tenuissimis sculpta, semipellucido-alba, paululum inæquilateralis. Umbones parvi, parum

prominuli, aliquanto ante medium siti. Margo dorsi anticus leviter obliquus, subarcuatus, posticus minus descendens, curvatus. Latus anticum postico angustius, arcuatum. Margo ventris late curvatus, utrinque subæqualiter adscendens. Dentes cardinis inæquales divergentes, antico valvæ sinistræ, et postico in dextra crassis, insigniter bifidis. Margo anticus intus sulco elongato haud profundo exaratus. Fossa ligamenti elongata, intra marginem collocata.

This species does not probably attain large dimensions. It is a little longer than high, rounded, slightly inequilateral, the posterior side being a trifle the longer. It is thin, semitransparent, not glossy, colourless and finely concentrically striated, the striæ, however, under a compound microscope appearing rugose or even granulose. The dorsal outline is curved on both sides, and does not slope much. The obliquity is a trifle greater anteriorly than behind, where the arcuation is a little more pronounced than in front. The posterior end is certainly higher than the anterior, not much curved, and shouldered or obtusely and indistinctly angled where it runs into the dorsal margin. The lower outline is broadly arcuate, and ascends almost equally at each extremity. The umbones are small, a trifle antemedian, and only a little elevated above the margin. In the right valve the hinder tooth and in the left the anterior are twice as stout as the others and very deeply bifid, the former sloping towards the posterior end and the latter towards the front. The anterior dorsal margin in both valves is grooved within, the furrow being rather long and shallow, and commencing at the front tooth extends about half-way to the middle of the anterior end. In the right valve the dorsal outline, just over the front slender tooth, is faintly emarginate or feebly notched, or, in other words, slightly pressed over towards the tooth. The groove for the ligament is within the outer edge, elongate, rather broad and deep, so that little, if any, of the ligament would be visible exteriorly. The muscular scars are indistinct, but appear to be elongate and moderately large.

Length 4½ mm., height 4, diameter $2\frac{2}{3}$.

Habitat.—Station 187, near Cape York, North Australia, at a depth of 6 fathoms; also Flinders Passage, in 7 fathoms.

Diplodonta conspicua, n. sp. (Pl. XIV. figs. 11–11*a*).

Testa trigono-rotundata, alba, tenuis, subæquilateralis, concentrice exilissime striata. Margo dorsi antice arcuatus, postice vix longior, æqualiter curvatus, utrinque subæqualiter obliquus. Margo ventris late arcuatus, ad utrumque latus paulo adscendens, in dorsalem acute-rotundatim ambiens. Umbones parvi, acuti, aliquanto ante medium siti, parum prominuli. Dens anticus valvæ dextræ parvus, obliquus, posticus crassus, triangularis, conspicue in medio fissus, in valva sinistra parvus, gracilis, antico magno

bifido. Ligamenti fossa elongata, pone dentem posticum locata. Margo valvarum internus denticulis parvis insignibus circiter quinque antice instructus, postice acutus, inferne anguste complanatus. Cicatrices musculares magnæ, elongatæ. Pallii impressio haud sinuata.

This small species is a little longer than high, subtriangularly rounded, a trifle inequilateral, thin, not very glossy, moderately gibbous, semitransparent-white, finely sculptured with the concentric lines of growth. The umbones are minute, acute, produced only a little above the dorsal line, are scarcely incurved, and situated a trifle in front of the centre. The dorsal margin is considerably curved on both sides and descends a long way, forming with the broadly arcuate ventral edge sharply rounded extremities. The hinge-plate is not very strong, and furnished in each valve with two cardinal teeth, of which the hinder in the right valve and the anterior in the left are twice as strong as the others, and conspicuously bifid. These teeth are divergent, the anterior being directed towards the front and the posterior backwards. Behind the latter comes the internal ligament which rests in a narrow oblique groove separated from the tooth by an acute ridge. The inner edge of the valves is remarkable on account of five or six distinct denticles situated about the middle of the front side. The lower part especially towards the anterior end is narrowly flattened, whilst along the hinder dorsal slope the margin is more acute. The muscular scars are long and large, and the pallial line is simple.

Length 4 mm., height $3\frac{2}{3}$, diameter $2\frac{1}{2}$.

Habitat.—Station 187, depth 6 fathoms, coral mud; also Station 188, depth 28 fathoms, green mud; also Flinders Passage, at a depth of 7 fathoms; and finally Torres Strait, in 3 to 11 fathoms. All these localities are near Cape York, at the extreme north of Australia.

This interesting species is very remarkable on account of the denticulations on the front margin, which are very strong for so small and delicate a shell.

Diplodonta amboinensis, n. sp. (Pl. XIV. figs. 12–12*a*).

Testa subquadrata, convexa, albida, valde inæquilateralis, postice lata, obtusa, mediocriter arcuata, antice angustior, valde arcuata, incrementi lineis tenuibus (hic illic paucis majoribus) sculpta, plus minusve. præcipue latum posticum versus, minute subpunctata. Margo dorsi posticus elongatus, fere rectus, parum declivis, anticus valde descendens, vix curvatus, brevior. Umbones parvi, antemediani, in $\frac{1}{3}$ longitudinis collocati.

Length 18 mm., height 15, diameter 10.

Habitat.—Amboina, Molucca Islands, in 15 to 20 fathoms.

Like several other species of *Diplodonta*, this is mainly distinguished by its form. It is somewhat square behind, and the minute subpunctation of the surface, which is chiefly noticeable towards the hinder part, is a feature of some importance. The hinge and interior are of the usual character.

Diplodonta sp.

Habitat.—Port Jackson, in 2 to 10 fathoms.

One right valve only was obtained. It is of an ordinary rounded form, only moderately convex, as long as high, and presents the usual kind of concentric striation and the normal dentition of hinge. It seems to be distinct from any of the species previously recorded from the same district.

Diplodonta sp.

Habitat.—Station 135, Nightingale Island, Tristan da Cunha Islands, Mid South Atlantic, in 100 to 150 fathoms.

Only a single left valve of this species was obtained. It is old and thickened, and very closely resembles the British *Diplodonta rotundata*, but is rather more obtuse at the anterior end. The limits of the species in this genus are very difficult to decide, as the main character is that of form, which is a very variable one. In sculpture many of the species are alike, and there is hardly any departure from white in the colouring, nor does the dentition materially differ in many of the forms.

Diplodonta apicalis, Philippi.

Diplodonta apicalis, Philippi, Enum. Moll. Sicil., vol. i. p. 31, pl. iv. fig. 6, vol. ii. p. 24.

Habitat.—Tenerife, in 70 fathoms.

This species has already been recorded from the Canary Islands by the late R. MacAndrew. It is considered by some authors identical with *Diplodonta trigonula*, Bronn, but Philippi held them distinct. Not having had an opportunity of consulting Bronn's description and figure, or of examining a specimen, I prefer to adopt the name given by Philippi.

Family Kellidæ.

Kellia, Turton.

Kellia suborbicularis (Montagu).

Mya suborbicularis, Montagu, Test. Brit., pt. i. p. 39, and pt. ii. p. 564, Suppl., pl. xxvi. fig. 6.
Kellia suborbicularis, Turton, Dithyra Brit., p. 56, pl. xi. figs. 5, 6.
Kellia suborbicularis, Forbes and Hanley, Brit. Moll., vol. ii. p. 87, pl. xviii. figs. 9, 9*a*, 9*b*, and Pl. O fig. 4.
Kellia suborbicularis, H. and A. Adams, Genera Rec. Moll., vol. iii. pl. cxiv. figs. 8–8*c*.
Kellia suborbicularis, Jeffreys, Brit. Conch., vol. ii. p. 225, vol. v. pl. xxxii. fig. 2.

Habitat.—Station 149D, Royal Sound, Kerguelen, in 28 fathoms; volcanic mud.

Two specimens from this locality I cannot distinguish from this well-known European species, which has not, I believe, been previously met with farther south than the Canary Islands. One of them exhibited a very trifling difference in the hinge-plate, which was not, however, maintained by the second example.

Kellia nuculina, Martens (Pl. XI. figs. 4–4*b*).

Kellia nuculina, Martens, Sitzungsberichte Gesellsch. naturf. Freunde, Berlin, 1881, p. 79.

Testa minuta, ovata, albida vel pallide straminea, nitida, concentrice minute striata, modice convexa, inæquilateralis; umbones involuti, multum prominentes. Dentes cardinis validi, lateralibus apice haud remotis.

This minute shell is ovate, rather inequilateral, fairly convex, whitish, glossy, iridescent, and sculptured with very fine lines of growth. The ends are almost equally rounded, but the anterior is a trifle narrower than the posterior. The beaks are not very acute at the tips, and rather elevated above the curved hinge-line. The dentition of this little shell is rather well-marked. The right valve has a well-developed cardinal tooth in front of the umbo, and a second very slender one above, between it and the dorsal edge. The hinder lateral tooth in this valve is almost as near the beak as the cardinals, elevated, and separated from the outer margin by a broad deep groove. The two cardinals of the left valve are united above, forming a single angular tooth, and the posterior lateral is thick and elevated. The hinge-plate is continuous under the beaks, so that a rather large and somewhat triangular space occurs for the reception of the ligament.

Length 4½ mm., height 3½, diameter 2.

Habitat.—Off Christmas Harbour, in 120 fathoms; and Balfour Bay, Kerguelen Island, in 20 to 60 fathoms; also off Prince Edward Island, in 50 to 150 fathoms.

This species may at once be distinguished from *Kellia suborbicularis* by its different hinge and form. Not feeling perfectly certain with regard to the identification of these specimens, I therefore have given the above description.

Kellia rotunda, (Deshayes), var. (Pl. XI. figs. 5–5*b*).

Erycina rotunda, Deshayes, Proc. Zool. Soc. Lond., 1855, p. 181.
Kellia rotunda, Angas, Proc. Zool. Soc. Lond., 1867, p. 927.

Habitat.—Station 162, off East Moncœur Island, Bass Strait, in 38 fathoms (Challenger); Port Jackson (Challenger and Angas); also Newcastle, New South Wales (Angas); Moreton Bay (Deshayes).

The single specimen obtained by the Challenger at Port Jackson is considerably larger than any other that I have ever seen, and exceeds the dimensions of the types described by Deshayes. It is 14 mm. in length, nearly 13 high, and 8 in diameter. The form is hardly as rotund as that of the Moreton Bay specimens, for with age the posterior side appears to enlarge more rapidly so that the large shell under examination is rather more inequilateral. The specimens from Bass Strait exhibit a precisely similar outline, and consequently approach very closely the *Kellia cycladiformis* of New Zealand, and, indeed, I am rather inclined to believe that they will prove eventually variations of one and the same species. The specimen in Mr. Cumings' collection from North Australia (Jukes), assigned by Deshayes to his *Erycina cycladiformis*, is very different in form from the shells from New Zealand. It is rounder, having the anterior end narrower than the posterior, which is the reverse in the latter specimens as a rule, and not well shown in Deshayes's figure. Among a series of *Kellia cycladiformis* from New Zealand, presented to the British Museum by Colonel Bolton, there is a specimen of unusually large size, whose dimensions are worth recording. It is 17½ mm. long, 15 high, and 11 in diameter, an averaged sized specimen being about 12 in length, 10 in height, and 8 in diameter. The hinge-characters are precisely similar in both forms.

Kellia cardiformis, n. sp. (Pl. XI. figs. 6–6*b*).

Testa globosa, fere æquilateralis, tenuis, subcircularis, alba, liris confertis radiantibus tenuissimis ornata, incrementique lineis concentricis sculpta. Umbones leviter supra marginem dorsalem producti, ad apices obtusi, politi. Latus anticum regulariter arcuatum, posticum altius, minus curvatum, superne obtuse humerosum. Dentes cardinales valvæ sinistræ duo subvalidi, partem anticam versus inclinati, in dextra unicus obliquus, subbipartitus; dens lateralis posterior in utraque valva elongatus, gracilis, in sinistra margine dorsali sulco angusto separatus.

This little *Cardium*-like species is very thin, rather globose, somewhat circular and nearly equilateral. It is whitish, slightly glossy, sculptured with very fine radiating sulci with intervening rounded ridges which are crossed by fine concentric lines of growth. The hinder dorsal margin is higher than the front and less oblique, and joins

the lateral outline in a rounded angle. The side itself is only slightly excurved, whilst the opposite margin is semicircularly arched, as is also the basal edge. The umbones are slightly elevated above the hinge-line, and terminate in obtuse circular glossy shield-like bosses. The hinge is composed of two cardinal teeth in the left valve and a single one in the right. They slope forwards and are strong for so fragile a shell. In the right valve there is also an elongate slender lateral tooth, parallel with the hinder dorsal margin, from which it is separated by a narrow furrow, into which fits a corresponding tooth in the other valve. The internal ligament is small, situated immediately beneath the obtuse apices and behind the cardinal teeth in both valves. The interior is rather glossy, and, owing to the thinness of the shell, exhibits the radiate character of the external sculpture, which produces a crenulate margin to the valves.

Length 6 mm., height 6, diameter $4\frac{1}{3}$.

Habitat.—Station 194D, Royal Sound, Kerguelen Island, in 28 fathoms; volcanic mud.

This curious little species externally is not unlike a delicately sculptured *Cardium*.

Kellia adamsi, (Angas).

Lepton adamsi, Angas, Proc. Zool. Soc. Lond., 1867, pp. 910, 911, and 928, pl. xliv. fig. 11.

Habitat.—Port Jackson, in 2 to 10 fathoms.

Only a single right valve in poor condition was obtained. This species is wrongly placed in the genus *Lepton*, for the hinge-characters are quite different from those of that genus, but agree perfectly with those of *Kellia rotunda*, *Kellia suborbicularis*, &c. No doubt it was the punctate surface down each side of the valves which misled Mr. Angas in the location of this interesting species.

Montacuta, Turton.

Montacuta paula (A. Adams) (Pl. XII. figs. 1–1*b*).

Pythina paula, A. Adams, Proc. Zool. Soc. Lond., 1856, p. 47.
Pythina peculiaris, A. Adams, *op. cit.*, p. 47.

Habitat.—Station 188, south of New Guinea, in 28 fathoms (Challenger); Raine Island, Torres Strait (Adams); Ceylon for *Pythina peculiaris* (A. Adams).

I have very carefully studied the two forms, which I here unite as one species, and have come to the conclusion that the shell described as *Pythina peculiaris* is merely unusually distorted. The "tout ensemble" of the specimen, with the exception of the outline, is quite like that of *Pythina paula*, it is similarly sculptured, of the same texture, and has precisely the same dentition. This consists, in one valve (which may be regarded as the right), of two widely divergent cardinal teeth separated from the dorsal margins

by a deep groove. The anterior is rather shorter than the posterior, and both are prolonged some distance parallel with the dorsal edges, and form, as it were, lateral teeth also. In the other valve (the left?) the edge is prominent on each side so as to fit in the grooves in the opposite valve. Between the divergent cardinals under the umbones is a triangular space which receives the internal ligament.

Pythina arcuata, A. Adams, from the Philippine Islands, is a more inequilateral species, with a less incurved ventral margin, and is different in the hinge, the posterior tooth of the right valve being shorter than the front one, and neither laterally continued as in *Pythina paula*.

From the above description of the hinge of this species it will be seen that it would be more correctly placed in the genus *Montacuta*.

The dentition of the type of *Pythina* (*Pythina deshayesiana*, Hinds) is exactly that of *Kellia*, and the fact of the shell being divaricately plicate does not in my opinion entitle it to generic rank, but may perhaps be regarded of subgeneric importance.

A few other species which have been described as *Pythinæ* should certainly be placed in the genus *Kellia*, such are *Pythina mactroides*, Hanley,[1] and *Pythina nuculoides*, Hanley[2] = *Erycina denticulata*, Deshayes.[3] *Pythina cumingii*, A. Adams,[4] does not quite agree with *Kellia* in dentition, having two teeth on each side in the right valve and a single one on each side in the left which fit in between those of the other valves. Two other species, *Pythina arcuata*, A. Adams,[5] and *Pythina triangularis*,[6] A. Adams = *Mactra nucleus*, (Conrad?) Reeve,[7] should be placed in the genus *Montacuta* and *Pythina stowei*, Hutton,[8] although not absolutely identical as regards the hinge, sufficiently resembles *Pythina deshayesiana* as to be placed in the same subgeneric section, having similar divaricate sculpture.

Montacuta angasi, n. sp. (Pl. XII. figs. 2–2*b*).

Testa subæquilateralis, mediocriter convexa, ovalis, albida, vel dilutissime fuscescens, vix nitida, incrementi lineis tenuibus striata. Latus anticum obtuse rotundatum, posticum acutius; margo ventris late, regulariter curvatus. Umbones fere mediani, paulo supra marginem producti. Dentes laterales approximati, erecti. Pagina interna subnitida, pallidissime fuscescens, radiatim obsolete substriata. Cicatrices profundæ, fere æquales, linea pallii simplice bene impressa junctæ.

This species is longish oval, rather more pointed behind than in front, obscurely subtransparent, dirty whitish-brown, and sculptured with fine lines of growth. It is

[1] *Proc. Zool. Soc. Lond.*, 1856, p. 340. [2] *Loc. cit.*, p. 341. [3] *Op. cit.*, 1855, p. 182.
[4] *Op. cit.*, 1856, p. 47. [5] *Op. cit.*, 1856, p. 47. [6] *Op. cit.*, 1856, p. 47.
[7] Conch. Icon., fig. 102 (gen. *Mactra*). [8] Cat. Marine Moll. New Zeal., p. 76; Manual Moll. New Zeal., p. 157.

nearly equilateral, moderately convex, and has but little gloss upon the surface. The dorsal margin is not much curved near the umbones, but gradually rounds off into the sides, and the ventral outline is regularly widely arcuate, and a little more ascendant posteriorly than in front. The umbones are not very acute, central, and just a little raised above the hinge-line. The divergent lateral tooth on each side in the right valve is prominently raised, there being a wide triangular space between them under the umbo. The interior is not highly glossy, but exhibits traces of faint radiating striæ, principally towards the margin. The muscular scars are deep, shining, and united by a simple distinct pallial line.

Length 5½ mm., height 4, probable diameter of a perfect specimen 2½.

Habitat.—Port Jackson, New South Wales, in 2 to 10 fathoms.

Unfortunately only a single right valve of this species was dredged. It is, however, of sufficient importance to merit description, as it appears to be an addition to the fauna of Port Jackson, the Molluscan portion of which has been catalogued and described by my friend G. French Angas, after whom I have named the species.

Montacuta acuminata, n. sp. (Pl. XII. figs. 3–3*b*).

Testa parva, tenuis, semitranslucida, vitreo-alba, nitida, incrementi lineis tenuissime striata, subæquilateralis, ovato-triangularis, utrinque aliquanto acuminata, postice breviter subrostrata. Margo dorsi utrinque valde declivis, antice leviter arcuatus, postice rectiusculus. Margo inferior late curvatus, latus posticum versus haud profunde sinuatus. Umbones parvi, acuti, fere mediani. Dentes valvæ dextræ duo, quorum anterior prope umbonem locatus, posterior magis remotus, elongatus. Pagina interna nitida, radiatim substriata. Sinus pallii mediocriter magnus, latus.

This species is rather triangular, being acutely rounded in front and shortly beaked behind. It is very thin, semitransparent, hyaline, marked only by very fine lines of growth, rather inflated, and almost equilateral. The dorsal outline is very sloping on both sides of the beaks, the angle of divergence being about 108°. On the anterior side it is slightly excurved, but behind is nearly straight and sharply bent at right angles to the surface of the valves, forming a flat linear dorsal area. The ventral margin bulges somewhat at the middle, gently curves upwards anteriorly, and exhibits behind a faint sinuation. The beaks are about central, small and acute. The left valve possesses no teeth, and displays merely a slight thickening of the dorsal edge, just in front of the apex. The scar of the internal ligament in this valve is oblique, and under the posterior dorsal margin near the umbo. In the right valve there are two teeth, the one thin, shortish, erect, close to, but in front of the umbo, the other more remote and longer. The interior of the valves is glossy, faintly concentrically grooved near the lower margin, and more or

less distinctly radiately substriated. The pallial sinus is broadly curved, and reaches about one-third of the length across the valves.

Length 6 mm., height 5, diameter 3.

Habitat.—Station 185B, east of Cape York, North Australia, at a depth of 155 fathoms; coral sand.

Young shells do not show so much tendency to posterior rostration as those more adult.

Montacuta cylindracea, n. sp. (Pl. XII. figs. 4–4*b*).

Testa elongata, cylindracea, valde convexa, inæquilateralis, albida, utrinque rotundata, incrementi lineis tenuibus striata, epidermide tenui fibrosa præcipue prope marginem induta. Margo dorsi longior (anticus?) horizontalis, levissime arcuatus, brevior (posticus?) oblique curvatus. Margo ventralis late arcuatus utrinque ascendens. Umbones subacuti, paulo elevati, circiter in $\frac{1}{4}$ longitudinis collocati. Pagina interna alba, nitida. Cardinis margo aliquanto incrassatus, fossa obliqua ligamentum continente postice munitus. Cicatrix muscularis antica elongata, postica brevior, rotundata.

This species is very elongate and very inequilateral. It is rather cylindrical, rounded at both ends, a little wider in front than behind, and considerably swollen. It is moderately strong for the genus, sculptured with fine concentric lines of growth, whitish, clothed more or less, especially towards the outer margin, with a pale yellowish fibrous epidermis, which is narrowly reflexed within the valves. The longer, or what I consider the anterior dorsal margin, is horizontal and faintly excurved; the posterior, being very much shorter, descends obliquely and is somewhat arcuate. The lower outline is only slightly convex, and ascends rather more abruptly behind than in front. The umbones are moderately acute, a little raised above the hinge-line, and situated at about a fourth of the entire length from the posterior extremity. The hinge-plate is slightly thickened, especially behind the beaks, where there is a shallow oblique pit or socket for the reception of the ligament. The interior of the valves is white and a little glossy. The anterior muscular scar is very long, the posterior shorter, broader, and rounder.

Length 15 mm., height $8\frac{1}{2}$, diameter 7.

Habitat.—North Atlantic, in deep water.

This species is remarkable on account of its cylindrical form, the convexity of the valves, and its comparative solidity.

Montacuta occidentalis, n. sp. (Pl. XII. figs. 5–5*b*).

Testa transversim ovata, minuta, tenuis, valde inæquilateralis, utrinque rotundata, antice angustior, alba, nitida, incrementi striis minutis sculpta. Margo dorsi anticus

brevissimus, infra umbones leviter concave obliquus, posticus elongatus, primo rectiusculus, fere horizontalis. Umbones parvi, acuti, antrorsum inclinantes, antemediani, circiter in $\frac{1}{3}$ longitudinis collocati. Valva sinistra dente unico erecto lamelliformi utrinque munita, dextra marginibus dorsalibus lamelliformibus subdentata. Ligamentum internum infra umbones situm.

A single specimen is all that is at present known of this species. It is very small, moderately convex, ovate, rather narrower in front than behind, very inequilateral, thin, white, glossy, and sculptured with excessively fine lines of growth. The front dorsal margin is short, a little oblique, just a trifle excavated before the umbones, then somewhat arcuate and gradually rounding into the sharply curved extremity. The posterior margin is much longer, at first almost horizontal and straight, afterwards becoming a little arcuate and oblique. The ventral outline is widely curved and equally ascending at both ends. The beaks are small, curved over towards the front, very slightly produced, and situated in advance of the middle, at about one-third of the total length from the anterior end. The left valve has two erect lamellar very divergent teeth, of which the posterior is rather more strongly developed. They are separated by a broad triangular space, and stand out free from the outer margin. The right valve has no distinct teeth, but has the dorsal margin on each side elevated into thin prominences, which when the valves are closed fit into the grooves between the teeth and dorsal margins of the other valves. The ligament is internal, and situated beneath the umbones. All the muscular impressions on the inner glossy surface are indistinct.

Length $2\frac{1}{2}$ mm., height $1\frac{2}{3}$, diameter $1\frac{1}{4}$.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

It is impossible to say whether the above figures represent the full size attained by this species, but probably they do not.

Montacuta pura, n. sp. (Pl. XII. figs. 6–6*b*).

Testa elongata, valde inæquilateralis, tenuissima, alba, incrementi lineis tenuibus striata, utrinque rotundata, postice paulo angustata. Margo dorsi anticus elongatus, levissime arcuatus, fere horizontalis, posticus brevior, oblique curvatus. Margo inferior latissime curvatus. Umbones parvi, paulo supra marginem producti, ad apicem obtusi, longe pone medium collocati. Dens cardinalis unicus in valva dextra infra apicem situs, in sinistra nullus.

This little species is remarkably oblong, very fragile, white, very inequilateral, obtusely rounded at the anterior end, and a little narrower at the opposite extremity. It is smooth, glossy, rather convex, and sculptured only by the very fine concentric lines

of growth. The front dorsal margin is long, scarcely at all oblique, and only very faintly excurved. The hinder slope is very much shorter, much more sloping and more curved. The ventral outline is widely curved, without any sinuation. The umbones stand out a little above the dorsal margin, are situated about one-third of the total length from the posterior end, and terminate in a minute obtuse apex. There is in the right valve a single tubercular tooth beneath the umbo, and an elongate groove within the margin on the anterior side, for the reception of the raised edge of the opposing valve. Within the posterior margin, at a short distance from the apex, there is a slight denticular prominence, beneath which is found the oblique groove containing the internal ligament which extends as far as the anterior denticles. In the left there is scarcely any indication of teeth, but the denticular prominence on the posterior side, supporting the ligament, is fairly conspicuous. The muscular scars and the pallial impression are indistinct.

Length $6\frac{1}{2}$ mm., height 4, diameter $2\frac{2}{3}$.

Habitat.—Station 75, off Fayal, Azores, in 450 fathoms, volcanic mud; and Station VIII., off Gomera, Canaries, in 620 fathoms, volcanic mud.

This curious little species is remarkable for its oblong, inequilateral form, and is quite distinct from *Montacuta cylindracea*, which is proportionally less elongate, has a shorter internal ligament, and only the faintest indication of a groove within the anterior dorsal margin of the right valve.

In form this species closely resembles *Montacuta ferruginosa*, Montagu, but is rather more convex, has more prominent beaks, and different hinge-characters.

Family Solemyidæ.

Solemya, Lamarck.

Solemya patagonica, n. sp. (Pl. XI. figs. 1–1*a*).

Testa oblonga, postice paulo angustata, antice sensim latior, arcuatim truncata, epidermide crassa, nigro fusca, radiatim lirata et sulcata, ad marginem profunde scissa longeque extra valvas producta, induta. Linea dorsi ante umbones intus incrassata, densatione paulo ante medium aliquanto intra marginem producta. Pagina interna radiatim obsolete subcostata, costa obliqua submediana cæteris majore. Cicatrix postica profunda, oblonga, infernè linea elevata marginem dorsalem anticum versus producta, marginata; cicatrix antica magna, subpyriformis.

Length 31 mm., height 11, diameter 6.

Habitat.—Station 311, off west coast of South Patagonia, in 245 fathoms.

This is very like other species of the genus in general appearance, but may be

recognised by a certain difference of form and other characters within the valves. It is more truncate at the anterior or broader end than any other species with which I am acquainted. It is rather flatter than *Solemya parkinsonii*, Gray, from which it also differs in having a thickening along the front dorsal edge within the valves, which extends as far as the anterior muscular scar, where it diverges obliquely somewhat from the margin. Another distinguishing feature is the slender lira or raised line which borders the anterior side of the hinder deep scar, and then runs obliquely upwards as far as the middle of the front dorsal thickening. What portion of the ligament may have been internal I am not able to state positively, as only a single specimen was obtained, and that in a dead condition. A part of it may have rested in a slight transversely striated depression, or shallow groove, along the dorsal edge, both in front of and behind the beaks, but I do not think any portion of it was produced within at right angles to the dorsal margin, as in *Solemya parkinsonii* and *Solemya australis*.

Family Astartidæ.

Subfamily Astartinæ.

Astarte, J. Sowerby.

Astarte macandrewi, Smith (Pl. XV. figs. 1–1*a*).

Astarte macandrewi, Smith, Journ. Conch., vol. iii. p. 228.

Habitat.—Tenerife, in 70 fathoms.

This minute form was originally described from specimens collected by the late Robert Macandrew at the Canary Islands, and the distinctions between it and *Astarte triangularis* are pointed out in the paper above referred to.

Astarte magellanica, Smith.

Astarte magellanica, Smith, Proc. Zool. Soc. Lond., 1881, p. 41, pl. v. fig. 7.
Astarte magellanica, Smith, Journ. Conch., vol. iii. p. 226.

Habitat.—Prince Edward and Marion Islands, in 100 and 150 fathoms.

The specimens from these localities are either finely concentrically ribbed or have the ridges rather less distinct. In neither case are they so strong as in the single type from Boija Bay in the Strait of Magellan. Being smoother shells they more nearly resemble as regards sculpture *Astarte longirostra*, d'Orbigny, from the Falkland Islands. They differ, however, from that species in being less beaked at the umbones, and all have the inner edge of the valves finely crenulated with the exception of one small specimen which is evidently not full grown, a further proof (if any were needed) that the crenulation of

the margin is a sign of maturity. As d'Orbigny's typical specimens in the British Museum are larger than any as yet known of *Astarte magellanica*, and have smooth margins to the valves, it seems likely that that species has not wrinkled edges. This, however, is uncertain, as the adult shell possibly has yet to be discovered.

Subfamily Carditinæ.

Cardita, Brugière.

Cardita calyculata (Linné).

Cardita calyculata, Lamarck, Anim. sans vert., vol. vi. p. 24.
Cardita calyculata, Philippi, Enum. Moll. Sicil., vol. i. p. 55.
Cardita muricata, Sowerby, Proc. Zool. Soc. Lond., 1832, p. 195.
Cardita muricata, Reeve, Conch. Icon., vol. i. pl. iv. fig. 18, var.

Habitat.—Station 162, off East Monœuur Island, Bass Strait, in 38 to 40 fathoms, and off Tenerife, in 70 fathoms.

After a careful comparison of the few small valves from Bass Strait, with specimens of the same size from the coast of Piedmont, I am unable to detect any good and sufficient reasons for separating them specifically. The number of costæ is the same, but a few of them upon the anterior half of the valves may perhaps be slightly coarser in the shells under examination than in those from the Mediterranean, and the anterior end in the latter does perhaps project forward rather further beyond the umbones than in Australian shells. The hinge, however, is absolutely identical in both.

Cardita muricata of Sowerby, said to have been found at Crescent and Rapa Islands, and of which there is a specimen in the British Museum from Nairai, Fiji Islands, does not, in my judgment, present any satisfactory distinctive features.

The shell figured by Reeve under this name has the posterior ribs closer together than in the types described by Sowerby.

Cardita excavata, Deshayes.

Cardita excavata, Deshayes, Proc. Zool. Soc. Lond., 1852, p. 100, pl. xvii. figs. 1–3.

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms.

Three or four other forms of *Cardita*, viz., *Cardita essingtonensis*, Deshayes, *Cardita umbilicata*, Deshayes, and *Cardita pica*, Reeve, are very closely allied to the present species, and will probably eventually prove to be variations of the same shell. If the spotting and fine reddish lines on the ribs of this species were not somewhat peculiar, I should feel no hesitation in uniting it with *Cardita essingtonensis* or *Cardita pica* or *Cardita umbilicata*, these so-called species evidently belonging to one and the same.

Cardita canaliculata, Reeve.

Cardita canaliculata, Reeve, Conch. Icon., vol. i. fig. 40.
Cardita cardioides, Reeve, *loc. cit.*, fig. 49.
Cardita cumingii, Deshayes, Proc. Zool. Soc. Lond., 1852, p. 102, pl. xvii. fig. 15.

Habitat.—Station 212, Malampa, Basilan Strait, Philippine Islands, in 10 fathoms: sand.

On closely comparing the above forms, I fail to appreciate any just grounds for their separation. *Cardita crenulata*, Deshayes, is also very similar, and will in all probability eventually prove to be but a slight variety, the hinge being exactly the same in all.

Cardita beddomei, n. sp. (Pl. XV. figs. 5–5*a*).

Testa inæquilateralis, subtrigono-rotundata, crassiuscula, mediocriter convexa, albida, postice rufo notata, costis tenuibus radiantibus nodulosis circa 25 (sulcis intervenientibus subæqualibus) instructa: margo dorsi posticus valde declivis, vix curvatus, ventralis parum arcuatus. Umbones prominentes; lunula parva, cordata, lævis.

Var. Testa magis quadrata, costis circa 27 instructa.

This species is considerably inequilateral, moderately convex, thickish, trigonally rounded, whitish and dotted and spotted with a reddish colour down the posterior side. It is ornamented with about twenty-five fine radiating ribs, which are either equal to the intervening sulci or rather broader, and covered with numerous small nodules or solidified scales which are more or less compressed, especially those near the ventral margin. The beaks in the typical form are well raised, so that the dorsal margins become very oblique on both sides. The posterior is long and only very slightly excurved, the anterior in the region of the small cordate smooth lunule being a little excavated.

The interior is white, with a tinge of pale red towards the umbones.

Length 17 mm., height 16, diameter 11.

Habitat.—Station 162, off East Moncœur Island, Bass Strait, in 38 to 40 fathoms.

In the British Museum there are two or three specimens dredged in Bass Strait by Macgillivray during the voyage of the "Rattlesnake" which slightly vary from the Challenger specimen. They are rather more quadrate, and have a few additional costæ.

This species closely resembles *Cardita bimaculata* of Deshayes from New Zealand, but has more numerous ribs, less epidermis, a shorter lunule, and lacks the orange colour on the muscular impressions.

Cardita bimaculata, Deshayes.

Cardita bimaculata, Deshayes, Proc. Zool. Soc. Lond., 1852, p. 102, pl. xvii. figs. 4, 5.

Testa subquadrata, valde inæquilateralis, modice convexa, albida, pallide rufo punctata,

epidermide olivacea induta, costis radiantibus tuberculatis circiter undeviginti instructa, incrementi lineis in interstitiis sculpta. Lunula parva, fuscescens, elongato-cordata, impressa. Margo dorsi posticus rectiusculus parum obliquus, anticus leviter concavus, valde declivis, brevior. Latus posticum latum, rotunde subtruncatum, anticum angustius rotundatum. Margo ventris late curvatus. Umbones in circa $\frac{1}{4}$ longitudinis collocati.

This species is considerably longer than high, somewhat square, broader behind than in front, very inequilateral, and moderately convex. It is white, spotted upon the ribs with pale red, and more or less covered with an olive epidermis. The sculpture consists of about nineteen radiating costæ, which are rather slender, about as broad as the intervening sulci, and covered with small compressed nodules. In addition the grooves are crossed with rather strongly marked lines of growth. The lunule is generally tinged with brown, somewhat impressed, and elongate cordiform. The beaks are placed well towards the front, being about one-fourth of the length from that extremity. The central tooth of the right valve is large, white, acute above, and triangular, the two of the left valve diverging, and much smaller. The muscular scars are orange or brown, and the inner margin of the valves is strongly dentate.

Length 13 mm., height 11½, diameter 9.

Habitat.—Station 162, off East Moncœur Island, Bass Strait, in 38 to 40 fathoms.

This species was originally described by Deshayes from specimens said to have been collected in New Zealand, a locality not since confirmed, for Captain Hutton, in his Manual of New Zealand Mollusca, includes this species in the fauna of that country merely on the authority of the type-shells.

Cardita astartoides, Martens (Pl. XV. figs. 2–2*c*).

Cardita astartoides, Martens, Sitzungsberichte Gesellsch. Nat. Freunde, Berlin, 1878, p. 25.

Testa suborbiculata, crassa, antice et postice subæqualiter rotundata, margine dorsali antico concavo, postico convexo, gibbo, margine ventrali æqualiter arcuato; costis radiantibus latiusculis circa 18, parum elevatis, interstitia subæquantibus et lineis concentricis undulatis costas æque ac interstitia percurrentibus sculpta, periostraco crasso, nigrofusco costas suboccultante vestita. Dens cardinalis medius valvæ dextræ interdum distincte bifidus, anticus valvæ sinistræ subvalidus, trigonus, lateribus perpendiculariter decisus; impressio muscularis antica elongata, postica brevior.

Length 31 mm., height 27, diameter 15.

Habitat.—Station 149, Royal Sound, at Balfour Bay, Kerguelen Island, in 20 to 60 fathoms; and Station 150, between Kerguelen and Heard Islands, in 150 fathoms.

This species, as pointed out by Martens, bears a great resemblance to the North American *Cardita borealis* of Conrad, and may be regarded as the southern representa-

tive of that form. It certainly is more like that species than *Cardita relatina*, Smith, from South Patagonia, which we should not expect, considering how similar the fauna of that region and of Kerguelen Island appear to be.

Cardita astartoides is a much flatter and larger species than the Patagonian shell, and has much feebler radiating ribs.

The young of this species is clothed with a straw-coloured epidermis, and appears to be proportionally longer than the adult shell.

Cardita sp.

Habitat.—Port Jackson, in 2 to 10 fathoms.

Only a single right valve of this species, which I have not been able to identify, was obtained. It is squarish behind, narrowed in front, and covered with about twenty slender ribs, bearing numerous prickly hollow scales. The intervening sulci are deep, and just a trifle broader than the costæ. It is whitish and spotted with pale red upon the ridges, and the minute sunken cordate lunule is also stained with the same colour. The interior is faintly radiately grooved, the grooves corresponding to the external ribs. Length 9 mm., height 7.

Cardita dilecta, n. sp. (Pl. XV. figs. 4–4*a*).

Testa mediocriter inæquilateralis, subglobosa, parum crassa, antice rotundata, postice latior, minus rotunda, costis circiter 28 confertis, minime elevatis, striis concentricis numerosissimis sculptis instructa, albida rufofusco irregulariter notata et maculata. Lunula subprofunda, elongato-cordata. Margo dorsi posticus obliquus, rectus, anticus valde declivis, vix concavus. Pagina interna albida, plus minusve rufo tincta, margine denticulato circumdata.

This little *Cardium*-shaped species is rather thin and inequilateral, whitish or whitish-brown, variegated with short streaks of reddish-brown on the costæ, and stained down the posterior side with the same colour. It is sculptured with narrow radiating impressed lines, which leave between them about twenty-eight very little elevated round-topped ribs which are cut across by very numerous concentric striæ, producing very narrow transverse tubercles upon the costæ. The tubercles are about equal in width all over the valves, but a few down the hinder side are separated by rather broader grooves than the rest. The lunule is moderately deep and elongate heart-shaped. The hinge consists of a single conical cardinal tooth in the right valve, which fits in between two teeth in the left valve, whereof the posterior is very long and slender, forming the lower support of the ligament. The interior appears to be whitish, and more or less tinged with red.

Length 8 mm., height 6, diameter $5\frac{1}{2}$.

Habitat.—Station 162, off East Monœur Island, Bass Strait, in 38 to 40 fathoms.

This pretty species is remarkable for the depressed closely-packed costæ, and the very numerous narrow transverse tubercles upon them.

Cardita insignis, n. sp. (Pl. XV. figs. 3–3*b*).

Testa parva, alba, mediocriter convexa, subcircularis, subæquilateralis, liris confertis, radiantibus aliisque concentricis magis remotis concinne cancellata, plicis radiantibus 3 to 4 utrinque undulata. Umbones parvi ad apicem læves. Margo valvarum internus utrinque fortiter denticulatus, inferne simplex, acutus. Dentes cardinales duo in utraque valva, quorum anticus valvæ sinistræ et posticus dextræ crassi, triangulares. Cicatrices elongatæ, et linea pallii simplex. Ligamentum marginale.

This little species is as high as or even a trifle higher than long, fairly convex, rather circular, equilateral, and for so small a shell not very thin. It is white and minutely cancellated with numerous close-set very fine radiating liræ, and other concentric ones, which are, however, much farther apart. Besides this ornamentation the valves exhibit on each side three or four radiating depressions or folds, which impart a strongly dentate character to the inner margin, which is smooth elsewhere. The beaks are small, smooth at the tip, which inclines over towards the front. The dentition is strong. In the right valve there are two cardinal teeth, the posterior being much thicker than the other, from which it is separated by a triangular pit. The left valve also has two cardinals, but in this instance the anterior, immediately beneath the apex of the umbo, is far the stouter, the posterior being oblique and slender. The muscular scars appear to be rather long on both sides, and the pallial line simple.

Length $3\frac{1}{2}$ mm., height $3\frac{1}{2}$, diameter $2\frac{1}{2}$.

Habitat.—Station 188, south of New Guinea, in 28 fathoms; green mud.

This species will readily be recognised by the remarkable lateral sculpture and the strongly dentate margin. It is a small *Lucina*-like shell, but judging from the hinge-characters belongs to the genus *Cardita*.

Cardita (*Thecalia*) *concamerata* (Chemnitz).

Chama concamerata, Chemnitz, Conch.-Cab., vol. vii. p. 138, pl. l. fig. 506.
Chama concamerata, Wood, Ind. Test., pl. ix. fig. 15.
Cardita concamerata, Bruguière, Ency. Méth., p. 138, pl. ccxxxiv. fig. 6.
Cardita concamerata, Reeve, Conch. Icon., vol. i. figs. 42, *a*, *b*.
Cardita concamerata, Krauss, Südafr. Moll., p. 13.
Mytilicardia (*Thecalia*) *concamerata*, Chenu, Man. Conch., vol. ii. p. 136, figs. 652 and 654.
Mytilicardia (*Thecalia*) *concamerata*, H. and A. Adams, Genera Rec. Moll., vol. ii. p. 489.
Thecalia macrotheca, Adams and Angas, Proc. Zool. Soc. Lond., 1864, p. 39.

Habitat.—Sea Point, Cape Town.

On comparing the type of *Thecalia macrotheca* presented to the British Museum by G. F. Angas, Esq., with South African specimens of this well-known form, I cannot detect the slightest difference. With the above type Mr. Angas also gave four specimens without any internal cup-like process, which may be the male, if the sexes really be separate, as stated by Messrs. H. and A. Adams, of *Cardita concamerata*. Adams and Angas mention that this cup-shaped appendage is much larger in their species than in the Cape shell. As the size of this is found to vary when a good series of specimens is examined, this difference, which I do not observe, however, in the type, seems to me of little importance. On opening one of the Challenger specimens the cup was found to contain a number of fry. The foot is small, cleft at the bottom, and furnished with a byssus.

Two specimens which have no sinuation at the ventral margin, and lack the internal cup, are probably males. They are rather squarer at the anterior end, and the ridges down the hinder part are finer and one or two more in number.

Carditella, Smith.

Carditella exulata, n. sp. (Pl. XV. figs. 6–6*a*).

Testa transversa, subquadrata, crassiuscula, valde inæquilateralis, albida, mediocriter convexa, costis radiantibus circa quatuordecim rotundatis, concinne squamulatis instructa. Latus anticum fere perpendiculariter truncatum, posticum latius, rotundatum. Margo dorsi horizontalis, rectus, ventralis late arcuatus. Umbones parvi, acuti, fere terminales. Pagina interna nitida, alba, radiatim sulcata.

This minute species, externally, is very much like the young of *Cardita calyculata*, but more finely squamulated, and without the slight sinuation in the ventral margin occurring in that species. It is whitish, very inequilateral, squarish-oblong, obliquely or almost perpendicularly truncate in front, rather broad and rounded behind. The dorsal margin is about horizontal and rectilinear, and the ventral very gently arcuate. The beaks are small, acute, and all but terminal. The sculpture consists of about fourteen radiating rounded ribs, of which those on the hinder half of the valves are considerably broader than the rest, and separated by broader and deeper grooves, which do not, however, equal in width half that of the ribs, which are finely and closely scaled throughout. The interior of the valves is glossy, white, and radiately grooved, the grooves corresponding to the external costæ. The hinge consists of a single central conical triangular tooth in the right valve, which fits in between two more slender divergent teeth in the left. The lateral teeth are well developed and equidistant.

Length 4 mm., height $2\frac{3}{4}$, diameter 2.

Habitat.—Station 135, off Nightingale Island, Tristan da Cunha, in 100 to 150 fathoms.

This pretty little species is more oblong and inequilateral than any of the other forms belonging to this genus, all of which are shells of very small size.

Carditella capensis, n. sp. (Pl. XV. figs. 7–7*c*).

Testa parva, æquilateralis, mediocriter compressa, triangulariter ovata, albida, irregulariter rufo notata, costis radiantibus tenuibus pulcherrime nodulosis circiter 18 instructa. Margo dorsi utrinque levissime concavus, ventralis mediocriter arcuatus. Dentes cardinales duo inæquales in utraque valva, antico valvæ dextræ magno, conico, triangulari. Laterales utrinque distincti, æquidistantes. Ligamentum parvum, internum, infra umbones locatum. Cicatrices subprofundæ, magnæ. Margo ventris intus duplex, dentatus.

This is a fairly solid little species, triangularly ovate, angular above, curved below, and rather sharply rounded at the sides. It is moderately compressed, about equilateral, white, and irregularly marked upon the nodulose ribs with red. The sculpture consists of about eighteen fine radiating costæ, which are covered with closely arranged and rather compressed little nodules. The intervening grooves are rather deep, somewhat narrower than the ridges, and exhibit concentric lines of growth. The dorsal areas on both sides of the beaks are lanceolate, smooth, and a little sunken. The beaks are about central, slightly eroded at the extreme apex, and scarcely incline either towards the anterior or posterior side. The dorsal margins are very slightly concave, about equal in length, and converge at an angle of about 100 degrees. There are two unequal cardinal teeth in each valve, and a lateral on each side. The front cardinal in the right valve is stout, triangular, and conical, the hinder one being much smaller, slender, and neither joined to it, nor reaching to the dorsal edge above. The cardinals in the left valve are very divergent and more equal, the posterior one, on the contrary, being rather larger than the other. The anterior lateral in the right valve, and the posterior in the left, are separated from the outer edge by a distinct groove, which receives the marginal lateral respectively of the opposite valve. The ligament is small, entirely internal, and placed in a little pit beneath the apices. The muscular scars are rather large and deep, the anterior being longer than the posterior, which is roundish. The simple pallial line is also distinct and rather far from the margin, which is strongly dentate, and of a double contour, and the hinge-line between the umbones and the lateral teeth, under the microscope, is seen to be very peculiarly corrugated.

Length 4 mm., height $3\frac{1}{2}$, diameter $2\frac{1}{2}$.

Habitat.—Simon's Bay, Cape of Good Hope, in 15 to 20 fathoms.

This species is very like *Carditella pallida*, Smith, the type of the genus, from Port Rosario, Patagonia. It differs in being a little more solid, has a somewhat stronger hinge, more slender, more numerous, and more distinctly noduled ribs.

Cardilella torresi, n. sp. (Pl. XV. figs. 8 8*a*).

Testa parva, inæquilateralis, cordata, albida, rufo sparsim notata, costis radiantibus tenuibus quindenis pulcherrime squamulatis instructa. Lunula cordata, lævis, profunda; area dorsalis postica angusta, lanceolata, lævis, subprofunda. Margo dorsi posticus paulo obliquus, rectus, anticus brevior, concavus, lunula convexa interruptus. Latus anticum angustum, obtuse subangulatum, posticum subtruncatum. Cardo ut in *Cardilella angasi*.

This pretty little species is rather convex, somewhat cordate, narrowed in front, broad and subtruncate behind. It is whitish and sometimes spotted more or less with red. The sculpture consists of fifteen fine well-raised radiating ribs, which are beset with numerous small arched scales. The interstices between the ridges are fully twice their width, and exhibit strong wrinkled lines of growth and frequently a feeble radiating lira on each side of the costæ. The posterior dorsal slope is straight, and only a little oblique, the anterior, on the contrary, being very suddenly sloping and concave except where the small smooth cordate lunule projects a little along its central line. The hinder slope exhibits a narrow lanceolate smooth dorsal area which is also somewhat sunken. The umbones are a little elevated, incurved some distance in advance of the centre, and curve over towards the front. The ventral margin is well curved, and on each side where it meets the dorsal slopes forms a rounded angle. The hinge is composed of a strong central almost horizontally placed cardinal tooth in the right valve, fitting in between two in the left, of which the anterior is small, conical, and the posterior long and subparallel with the dorsal line. A lateral tooth is present on each side in both valves, the anterior in the right and the posterior in the left being the most distinct, and separated from the outer edge by a deep groove. The ligament is small and placed on the hinge-line above the posterior cardinal of the left valve. The interior is grooved, the grooves corresponding with the external ribs, and the outer margin is strongly and squarely dentate.

Length 5 mm., height $4\frac{1}{3}$, diameter $3\frac{2}{3}$.

Habitat.—Station 188, south of New Guinea, in 28 fathoms; also Torres Strait, in 3 to 11 fathoms.

In this species and *Cardilella angasi* and *Cardilella cupensis* the hinge-plate between the cardinal and lateral teeth is peculiarly striated with wrinkles.

Cardilella angasi, n. sp. (Pl. XV. figs. 9–9*a*).

Testa subquadrata, valde inæquilateralis, antice angusta, postice lata, rotunde truncata, alba, supra costas rufo irregulariter maculata, costis radiantibus tenuibus nodulosis

circa 21 instructa; lunula cordata, rufescens, impressa. Pagina interna alba, umbones versus sordide fuscescens. Dens unicus cardinalis in valva dextra crassus, triangularis, inter duos valvæ sinistræ interpositus. Dentes laterales in utraque valva parvi, parum remoti.

This species is somewhat square, narrowed and rounded in front, broad and curvedly truncate behind. It is very inequilateral, moderately convex, white and promiscuously spotted with red upon the radiating costæ which adorn the surface. These are rather fine, about twenty-one in number, finely nodulose, and about equal in width to the grooves between them, five or six on the upper part of the posterior end being a trifle finer than the rest. The posterior dorsal margin is almost horizontal and straight, the anterior, on the contrary, being very suddenly oblique and the ventral margin is broadly curved. The lunule is small, cordate, reddish, a little sunken, and clearly defined. The hinge consists of a strong central triangular tooth in the right valve which fits in between two in the left. There is a distinct lateral tooth on each side in both valves, which are about equidistant, but not very remote from the cardinals. The interior is white, but stained with brown beneath the umbones, and of course dentate at the margin.

Length $6\frac{2}{3}$ mm., height 5, diameter $3\frac{2}{3}$.

Habitat.—Station 163B, Port Jackson, New South Wales, in 35 fathoms; hard ground.

The ligament in this species, as well as in *Carditeila torresi*, does not quite correspond with that of the type of the genus, no portion of it apparently being internal beneath the umbones.

Carditeila infans, n. sp. (Pl. XV. figs. 10–10*a*).

Testa minuta, solidiuscula, rotundata, convexa, lunulata, albida, costis circa 18 rotundatis, confertis, pulcherrime granulatis instructa. Lunula cordata, lævis, in medio prominens. Umbones paulo antemediani, incurvati, antrorsus versi. Margo dorsi posticus declivis, parum arcuatus, anticus subexcavatus; margo ventris valde curvatus.

This species, though so small, apparently is adult. It is rounded with the exception of the somewhat prominent beaks, a little inequilateral, whitish, fairly solid and convex, and exhibits a smooth cordate lunule, which is rather prominent along the middle and thus interrupts the otherwise concave front dorsal oblique slope. The sculpture consists of about eighteen rounded radiating ribs which are twice or three times as broad as the narrow deep grooves between them, and are covered with closely packed transverse tubercles. The umbones are peaked, somewhat in advance of the middle, well incurved, and inclined over towards the front. There is a single central strong acute triangular cardinal tooth in the right valve which fits in between two divergent but smaller teeth in

the left. The lateral teeth are distinct on both sides, the anterior in the right valve and the posterior in the left being separated from the outer margin by a deepish groove, the posterior in the former and the front one in the latter being, on the contrary, on the margin. The hinge-plate between the cardinal and lateral teeth is seen under the microscope to be finely transversely striated, and the outer margin is strongly dentate within.

Length $2\frac{2}{3}$ mm., height $2\frac{2}{3}$, diameter 2.

Habitat.—Station 188, south of New Guinea, in 28 fathoms; green mud.

This species is remarkable for its small size and the crowded transverse tubercles on the radiating costæ, which are separated by very narrow but deep intervening grooves.

Family Crassatellidæ.

Crassatella, Lamarck.

Crassatella aurora, A. Adams and Angas.

Crassatella aurora, A. Adams and Angas, Proc. Zool. Soc. Lond., 1863, p. 126, pl. xxxvii. fig. 15.

Habitat.—Station 162, off East Moncœur Island, Bass Strait, in 38 fathoms; sand and shells.

The types of this species, liberally presented to the British Museum by G. F. Angas, Esq., were collected at Banks Strait, Tasmania. They are rather more finely ribbed than would appear to be the case judging from the figure. The Challenger specimens, which are all smaller than the shell figured, have, however, coarser ribbing, the ribs being attenuated laterally and scarcely reaching to the dorsal margins. The two interrupted brownish rays appear to be a constant character, and the interior exhibits more or less of a delicate rose colour. The hinge-plate on both sides of the cardinal teeth is also rose-tinted, and the inner edge of the valves along the ventral margin is finely crenulated.

Crassatella rhomboides, n. sp. (Pl. XVI. figs. 1–1*a*).

Testa compressa, quadrata, albida, vel pallide rufescens, valde inæquilateralis, concentrice subdistanter tenuiter lamellato-costata, striis microscopicis interruptis concentricis undique sculpta. Margo dorsi posticus subhorizontalis, rectus, elongatus, anticus abrupte obliquus, subperpendicularis, rectilinearis. Margo ventralis vix curvatus, dorsali postico subparallelus. Latus anticum inferne rotunde angulatum, posticum truncatum, supra et infra subrecte angulatum. Umbones parvi, acutissimi, ad apicem conico-producti, partem anticam versus collocati. Dentes cardinales graciles, elongati. Margo valvarum internus inferne denticulatus.

This species is flat, rhomboidal, very inequilateral, white or pale brownish and faintly blotched with brown, concentrically finely costate, the ribs being sublamellar, moderately remote, and roundly angulated at a faint raised indistinct ridge radiating from the beaks to the lower hinder extremity. The lunule is elongate, very narrow, grooved on each side of a raised centre, and smooth. The posterior dorsal margin is almost horizontal, straight, and longer than the anterior, which descends almost at right angles, and is also rectilinear. The lower outline is very slightly excurved, and forms a rounded corner at both ends. The dorsal area is linear, flat, and not affected by the concentric ribs. The umbones are minute, acute, and peculiarly produced at the apex into a small conical peak, and situated a very little posterior to the anterior extremity. The two cardinal teeth of the left valve are slightly divergent from one another, elongate and slender, the anterior being a trifle the thicker, and about equal to the single tooth of the other valve. The lateral teeth and grooves are distinct and elongate. The outer surface is everywhere very minutely sculptured with fine concentric striæ which are broken up by others that radiate from the umbones, a kind of sculpturing such as obtains in the genus *Myodora*. The anterior muscular impression is elongate and subpyriform, the posterior being rather larger and rounder. The interior is minutely denticulate along the ventral margin, but smooth elsewhere.

Length 8 mm., height 6, diameter $2\frac{1}{2}$.

Habitat.—Station 188, south of New Guinea, in 28 fathoms; also Station 187, near Cape York, North Australia, in 6 fathoms.

This is a pretty little species resembling externally the genus *Myodora* both as regards form and sculpture, but having the dentition and non-sinuated pallial line of *Crassatella*. This, together with *Crassatella aurora*, belong to what I think is an unnecessary subgenus (*Crassatina*) proposed by Weinkauff, which is distinguished from the typical *Crassatella* only by having the inner edge of the valves crenulated.

Crassatella parva (C. B. Adams).

Gouldia parva, C. B. Adams, Proc. Bost. Soc. Nat. Hist., 1845, p. 9.
Astarte lunulata, Conrad, Amer. Journ. Sci. and Arts, 1846, vol. ii. p. 393.
Crassatella guadalupensis, d'Orbigny, in Sagra's Hist. Cuba, vol. ii. p. 289, pl. xxvii. figs. 24–26.
Gouldia guadalupensis, H. and A. Adams, Genera Moll., vol. ii. p. 485.
Astarte mactracea, Linsley, Amer. Journ. Sci. and Arts, vol. xlviii. p. 275 (woodcut).
Gouldia mactracea, Gould, Invert. Mass., ed. 2, 1870, p. 128, fig. 442.
Astarte pfeifferi, Philippi, Zeitschr. Malakozool., 1848, vol. v. p. 133.
Gouldia pfeifferi, Tryon, Proc. Acad. Nat. Sci. Philad., 1872, p. 249.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

The form of this species is very variable, but the concentric ribbing and microscopic sculpture appears to be fairly constant.

In the Proceedings of the Zoological Society, 1881, p. 490, I gave 1841 as the date of publication of d'Orbigny's *Crassatella guadaloupensis*. This, as pointed out by Mr. Dall,[1] appears to be incorrect. At the time I did not consult the work itself but referred to Moquin-Tandon's list of authors and their works, at the end of the first volume of his Hist. Nat. Moll. terr. et fluv. de France. The year 1841 is there quoted for the issue of Sagra's Histoire de Cuba. Mr. Dall takes the first of the two species of *Gouldia* described by Professor C. B. Adams as the type of the genus. On the contrary, I think that the second species, *Gouldia parva*, should be retained as the type, for this reason, that its adoption was confirmed by Adams himself when he described another species, *Gouldia pacifica*, belonging to the same Crassatelloid group. Notwithstanding Mr. Dall's dissertation on this genus, I still maintain that *Gouldia* is unnecessary, an opinion also shared by Mr. Boog Watson.[2]

Mr. Dall observes that there are "abundant reasons" for separating *Gouldia* (*cerina*) from *Circe* "on conchological grounds alone." It is unfortunate that he does not point out a few of them, for, as far as I can discover from his observations, there seems to be only one difference, that of sculpture.

If difference of sculpture alone is to be held of *generic* importance, I think I may fairly say that the genera of Mollusca might at once be doubled or trebled in number. On that principle *Conus cancellatus*, with its strongly ridged surface, and *Conus marmoreus*, which is smooth, belong to different genera, *Nassa glans* and *Nassa papillosa* are not congeneric, and so on in innumerable instances.

A few words on the variation of sculpture in the genus *Circe* may not be out of place. *Circe scripta*, the type of the genus, is a flat, concentrically ridged shell with a little radiating sculpture at the sides near the beaks. *Circe albida* is equally flat and concentrically ribbed with only the slightest trace of the lateral oblique sculpture. *Circe divaricata* is more convex, finely concentrically ridged and ornamented all over the surface with divaricate sculpture. *Circe dispar* is also convex, concentrically ridged, but with less oblique sculpture. *Circe lentiginosa* is equally swollen as the last species, concentrically ridged, but without the diverging ornamentation. *Circe castrensis* is also gibbous, more or less concentrically ridged, and is painted with angular markings as in *Circe scripta*. *Circe trimaculata* and *Circe cerina* (*Gouldia*, part, C. B. Adams), are gibbous, finely concentrically ridged throughout, but without angular markings. Many more forms might be mentioned, which would be intermediate in respect of sculpture between some of those species which I have referred to. Anyone therefore, who will place side by side *Circe scripta*, *Circe albida*, *Circe divaricata*, *Circe dispar*, *Circe lentiginosa*,

[1] *Bull. Mus. Comp. Zool.*, vol. ix., No. 2, p. 128.

[2] Journ. Conchol., vol. iii. p. 299

Circe castrensis, *Circe trimaculata*, and *Circe cerina*, will, I think, perceive the gradual transition of one form into the other, and will be convinced that neither *Lioconcha* nor *Gouldia* (as understood by Dall) should take generic if even subgeneric rank.

Mr. Dall states that "we do not know the animal of *Circe*." This is not correct, for Deshayes (Proc. Zool. Soc. Lond., 1853, p. 171) has examined the soft parts of several species belonging to the two principal groups of the genus "(*Circe scripta*, Linn., and *Circe testudinalis*, Chemn.)," and figures the animal of *Circe divaricata*. He observes that "ces animaux ne diffèrent en rien de celui des *Meretrix*" and "de cette identité, parfaitement constatée pour nous, entre les *Meretrix* et les *Circe*, nous concluons que ce dernier genre doit rentrer dans le premier à titre de simple division ; en réunissant les espèces des deux groupes on voit s'établir entre elles une transition insensible dans la transformation de formes extérieures."

Römer, in his monograph of the genus *Venus*, regards *Lioconcha* as a "sectio" of *Cytherea*, which is termed by him merely a subgenus of *Venus*. *Circe* he also considers a section in the same way.

Gouldia parva, which I hold as the type of the genus, is considered by Dall to belong to *Eriphyla* of Gabb, which is stated by Dall to be a subgenus or section of *Crassatella*. This location of *Eriphyla* cannot, however, be correct, if Gabb's description is to be relied upon, for, besides an external ligament, that genus apparently has a different hinge, and according to Stoliczka partakes more of the general character of certain forms of Veneridæ. Dall says that *Gouldia parva* and the like "differ from the typical *Crassatella* chiefly in form, in the elongation and more distant location of the lateral teeth, the usually unequal valves, and in their uniformly small size." Now, of these points of distinction, I maintain that form and size are not generic or even subgeneric characters, the inequality of the valves I fail to discover in the series of specimens in the British Museum, and the difference mentioned in regard to the lateral teeth does not appear to me to exist. In *Crassatella kingicola*, which may be regarded as a typical species, I find the posterior lateral teeth and those less pronounced on the anterior side, extending from the upper end of the muscular impressions towards the umbones. This too is constant in all the other species of the genus which I have examined, including that under discussion, *Crassatella parva* of C. B. Adams. To show the absolute agreement of this form with *Crassatella* I would point out two minor features which I believe have not as yet been referred to, namely, the coarsely striated character of the cardinal teeth and the presence of a small deep distinct pedal muscular scar just above the anterior adductor impression.

A summary of the whole discussion and difference of opinion may be given in a few words.

I regard *Gouldia parva* as the typical species; Dall holds to *Gouldia cerina*. I

maintain that the former species is absolutely identical with *Crassatella*, hence the disappearance of *Gouldia* from conchology. Dall holds that the latter species is generically distinct from *Circe* "on conchological grounds alone." This I deny, and am of opinion that it possesses at most sectional or subgeneric rank, and may therefore be placed in *Lioconcha* if this separation be thought advisable. To give names to such minor sections, if they be fairly recognisable, is I think allowable, and to a certain extent useful in those genera which contain a large number of species, but in small groups this practice should not be encouraged.

Crassatella torresi, n. sp. (Pl. XVI. figs. 2 2*a*).

Testa parva, valde compressa, tenuis, alba, trigona, costis concentricis paucis postice incrassatis et productis instructa. Margines dorsi valde declives, fere æquales, antico levissime concavo, postico vix convexo; margo ventralis maxime curvatus. Umbones parvi acuti, mediani. Dens cardinalis unicus in valva dextra, duo in sinistra; laterales utrinque perremoti. Ligamentum angustum, in sulco marginali locatum, partim internum, in fossa parva infra apices positum.

This little species is very compressed, equilateral, quadrant-shaped, thin, semi-transparent, white, and ornamented with about a dozen rather remote concentric ridges. They are thickened at their posterior extremities and a trifle prolonged into scale-like projections, forming a crest along the dorsal margin. Between the costæ very fine radiating striæ are discernible under the microscope. The dorsal margins are of equal length, and form almost a right angle at the apex. The anterior is the least concave, and the posterior the slightest excurved. There is a single central longish cardinal tooth in the right valve, which fits in between two equally long ones (of which the posterior is rather the larger) in the left, and the former valve exhibits a distinct very remote lateral on each side, separated from the outer margin by a conspicuous furrow which receives the prominent lateral margins of the other valve. The slender ligament is situated in a narrow posterior marginal groove, and a small portion of it is internal and located in a very small pit beneath the beaks and just posterior to the cardinal teeth. The interior of the valves is smooth and glossy, and owing to their transparency exhibits the external ribbing. The outer margin is simple, smooth, and non-crenate. The muscular scars and pallial line are not clearly definite.

Length $3\frac{1}{2}$ mm., height $3\frac{1}{4}$, diameter 1.

Habitat.—Station 188, south of New Guinea, in 28 fathoms green mud.

The single minute shell here characterised may not be, and probably is not, adult, but is sufficiently distinct and peculiar to merit description.

Family TRIGONIIDÆ.

Trigonia, Bruguière.

Trigonia lamarckii, Gray.

Trigonia lamarckii, Gray, Ann. and Mag. Nat. Hist., 1838, p. 482.
Trigonia lamarckii, A. Adams, Proc. Zool. Soc. Lond., 1849, p. 159.
Trigonia lamarckii, Reeve, Conch. Icon., vol. xii. figs. 1*a*–1*c*.
Trigonia lamarckii, var. *reticulata*, Tenison-Woods, Proc. Linn. Soc. N. S. Wales, 1877, vol. ii. p. 125.
Trigonia pectinata, (non Lamarck) Stutchbury, Zool. Journ., vol. v. p. 97, Tab. Suppl. xlii.
Trigonia pectinata, Canefri, Viagg. Magenta, p. 137.

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms.

I would here remark that *Trigonia jukesii*, A. Adams, is identical with *Trigonia uniophora*, Gray, and quite distinct from the present species, to which it is united by Reeve.

Trigonia margaritacea, Lamarck.

Trigonia margaritacea, Lamarck, Ann. du Mus., 1804, vol. iv. p. 355, pl. lxvii. fig. 2.
Trigonia margaritacea, Sowerby, Gen. of Shells, pl. lxxxiv. figs. 1, 2.
Trigonia margaritacea, H. and A. Adams, Gen. Moll., pl. cxxiv. figs. 1–1*b*.
Trigonia margaritacea, Reeve, Conch. Icon., vol. xii. figs. 3*a*–3*d*.
Trigonia margaritacea, Huxley, Proc. Zool. Soc. Lond., 1849, p. 31, pl. iii. figs. 1–3 (animal).
Trigonia margaritacea, Huxley, Ann. and Mag. Nat. Hist. 1850, vol. v. p. 141.
Trigonia margaritacea (?), Selenka, Mal. Blät., 1868, vol. xv. p. 66, pls. ii. and iii.
Trigonia pectinata, Lamarck, Anim. sans vert., ed. 2, vol. vi. p. 514.
Chama pectinata, Wood, Index Test. Suppl., pl. ii. fig. 6.

Habitat.—Station 162, off East Moncœur Island, Bass Strait, at a depth of 38 fathoms; sand and shells.

This species is also found at Port Lincoln, South Australia, the variety from that region having the tubercles on the ridges very much crowded.

Trigonia uniophora, Gray.

Trigonia uniophora, Gray, Jukes' Voy. of the "Fly" (1847), vol. ii., Appendix, p. 361, pl. ii. fig. 5.
Trigonia uniophora, Reeve, Conch. Icon., vol. xii. pl. i. figs. 2*a*, 2*b*.
Trigonia jukesii, A. Adams, Proc. Zool. Soc. Lond., 1849, p. 159, pl. iii. figs. 4–6.

Habitat.—Near Cape York, off Albany Island, in 3 to 12 fathoms; Stations 188 and 189, south of New Guinea, in 25 to 28 fathoms.

This species is quite distinct from *Trigonia lamarckii* from Port Jackson, differing not only in sculpture but also in form, the emargination of the posterior truncated side being constant in all specimens. It is only known at present as an inhabitant of the region between North Australia and New Guinea.

Family NUCULIDÆ.

Nucula, Lamarck.

Nucula obliqua, Lamarck.

Nucula obliqua, Lamarck, Hist. Nat. Anim. sans vert., ed. 2, vol. vi. p. 505.
Nucula obliqua, Hanley, in Sowerby's Thes. Conch., vol. iii. p. 156, pl. ccxxx. fig. 150.
Nucula obliqua, Chenu, Manuel Conch., vol. ii. p. 179, fig. 897, from type *teste* Hanley.
(Non *Nucula obliqua*, Sowerby, Conch. Ill., fig. 21; and Hanley, Cat. Recent Biv. Shells, p. 171, pl. xx. fig. 9 = *Nucula grayi*, d'Orbigny.)

Habitat.—Station 188, south of New Guinea, at a depth of 28 fathoms; also Torres Strait, 3 to 11 fathoms (Challenger); Arafura Sea, North Australia, 32 to 36 fathoms (Dr. Coppinger of H.M.S. "Alert"); Cap aux Huitres, Australia (Péron *teste* Lamarck).

This appears to be the largest living species of the genus *Nucula*. A single valve from the Arafura Sea collected by Dr. Coppinger is 28 mm. in length and 20 high. At this age it is a strong solid shell, internally thickened along the ventral margin, having deep muscular impressions. The hinge-teeth are long, acute, keeled on the sides towards the umbones, and excavated exteriorly. In the largest specimen there are twenty-six on the anterior margin and only seven posteriorly, and in another example of half the length there are twenty in front and five behind. The ligament-pit is horizontal, deep, and narrow. The internal nacre is whitish, or tinted with pale brown or red. The excessively fine crenulation of the margin described by Hanley is preserved in the oldest specimens.

Nucula nitidula, A. Adams.

Nucula nitidula, A. Adams, Proc. Zool. Soc. Lond., 1856, p. 51.
Nucula nitidula, Hanley, in Sowerby's Thes. Conch., vol. iii. p. 150, pl. ccxxix. fig. 142.
Nucula nitidula, Sowerby, Conch. Icon., vol. xviii. pl. iv. fig. 27.
Nucula nitidula, Hutton, Man. New Zeal. Moll., p. 164.

Habitat.—Station 167A, Queen Charlotte Sound, Cook Strait, New Zealand, in 10 fathoms; mud.

This species is remarkable for its oblique narrow form, the almost rectilinear or very slightly curved hinder dorsal slope, and its prominent defined lunular space.

Nucula sp.

Habitat.—Station 191, off the Arrou Islands, in 800 fathoms; green mud.

Only a single dead valve of this species was discovered, and that not in a good state of preservation. Its existence is worthy of record, as indicating the presence at this locality of a large species which in many respects closely resembles the *Nucula decussata* of Europe. It is perhaps a trifle flatter than that form, and the anterior side in the region of the lunule is rather more concave, but the external sculpture is about the same. The hinge-plate and the teeth appear to be less strongly developed, and the outer or ventral margin is not quite so distinctly lirate within.

The valve under examination is 22 mm. in length and 18½ in height.

Nucula niponica, n. sp. (Pl. XVIII. figs. 8–8*a*).

Testa magna, tenuis, ovalis, valde inæquilateralis, epidermide nitida olivacea induta, incrementi lineis tenuibus striata, lineis paucis radiantibus obsoletis impressa. Lunula inconspicua, impressione haud profunda circumdata. Umbones pallidi, convoluti, circa in ¼ longitudinis totius positi. Pagina interna iridescens, cæruleo-margaritacea, radiatim tenuissime substriata, ad marginem acuta et integra. Fossa ligamenti profunda, intra valvas oblique projecta. Dentes elongati, acuti, in numero circa 25, quorum octo ante umbones sunt.

This is a fine large species, comparatively thin, of an oval form, the anterior extremity being just a trifle more acute than the posterior. It is very inequilateral, and clothed with a highly glossy olivaceous epidermis, which is paler towards the umbones, and exhibits, at irregular intervals, narrow, concentric, darker zones. The sculpture consists of fine lines of growth (some of them amounting to shallow concentric grooves) and several feebly expressed radiating impressed lines. The lunule is rather long, prominent along the middle, not clearly defined, but only marked off by a shallow depression, and occupies the greater part of the anterior slope. The beaks are pale, small, incurved, and located at barely one-fourth of the total length from the anterior end. The interior is iridescent pearly, the predominant colour being blue. It exhibits a very minute radiating substriation, and is surrounded by a sharp, simple, non-crenate edge. The hinge-teeth are fairly strong, longish, acute, about twenty-five in number, of which only eight are in front of the deep, oblique, inwardly projecting ligament-pit.

Length 22 mm., height 15, diameter 9.

Habitat.—Station 232, south of the Island of Nipon, Japan, in 345 fathoms: green mud.

Nucula torresi, n. sp. (Pl. XVIII. figs. 9 9*a*).

Testa parva, solidiuscula, triangularis, paulo inaequilateralis, convexa, albido-fuscescens, epidermide ? induta, costulis tenuibus concentricis instructa, radiatimque striata. Lunula magna, in medio prominens, impressione haud profunda circumscripta. Margo dorsi utrinque vix excurvus; posticus paulo magis elongatus, sed minus obliquus. Pagina interna albo-margaritacea, margine inferiore intus minute crenulato. Dentes ad quatuordecim fortiusculi, prope medium seriei fossa parva ligamenti interrupti.

This is rather solid for so small a species, a little unequal-sided (the anterior end being the shorter), of a triangular form, bluntly angled at the anterior end, and rather more rounded behind. It is considerably convex, of a whitish brown colour, and, in a dead condition (the few valves preserved are in this state), presents no trace of an epidermis. The sculpture consists of numerous concentric riblets, which are attenuated at the sides, and exhibit, principally in the intervening grooves, fine radiating striæ. The dorsal margins converge almost to a right angle, and are scarcely at all excurved, the anterior being shorter and more oblique than the posterior, and faintly bulged by the central line of the large lunule, which is marked off by a shallow depression. The umbones are rather blunt, but incurved at the small tip and decidedly in front of the centre. The interior is thickened, pearly white, and minutely crenulated along the lower border. The hinge-plate is strong, and supports about fourteen teeth, of which six are usually in front of the small non-projecting ligamental pit.

Length $2\frac{3}{4}$mm., height $2\frac{2}{3}$, diameter 2.

Habitat.—Station 185, east of Cape York, North Australia, in 135 fathoms; coral sand.

This species is remarkable for its solidity, its comparative equal-sidedness, and the strong character of the concentric sculpture.

Nucula pernambucensis, n. sp. (Pl. XVIII. figs 10 10*a*).

Testa irregulariter quadrate ovata, modice convexa, inaequilateralis, concentrice tenuiter sulcata et lirata, alba, nitida. Umbones antemediani, paulo supra marginem dorsalem producti. Linea cardinis mediocriter fortis, dentibus ad decem instructa.

This species is longer than high, irregularly squarely ovate, moderately convex, somewhat inequilateral, white, glossy, and sculptured with regular, fine, concentric grooves, and intervening lirae, except upon and towards the smooth apices. The lunule and dorsal area are not defined. The posterior dorsal margin rises higher, and is longer, than the anterior, which, however, is more sloping. The ventral outline is widely arcuate, and forms with the hinder lateral margin a rather more sharply rounded extremity than in front. The beaks, viewed from the side, are somewhat obtuse,

incurved at the tips, and situated considerably in front of the middle. The interior is pearly white, and the inner edge of the valves smooth. The hinge-plate is moderately strong, and furnished with ten or eleven stoutish teeth, six of which on the posterior side are larger than the four or five on the opposite margin.

Length 3 mm., height $2\frac{1}{4}$, diameter $1\frac{1}{2}$.

Habitat.—Station 120, off Pernambuco, Brazil, in 675 fathoms; red mud.

The few small valves here described bear considerable resemblance to *Nucula corbuloides* of Seguenza, a Tertiary fossil from Italy, but are, I believe, distinct; for, besides a difference in form, the surface cannot be described as "lævis, lineis incrementi paucis signata" (Seguenza), the concentric striæ in the present species being regular, numerous, and even strong for so small a shell.

Nucula culebrensis, n. sp. (Pl. XVIII. figs. 11–11*a*).

Testa subcompressa, mediocriter crassa, valde inæquilateralis, ovato-trigona, concentrice tenuissime lirata, undique radiatim striata, postice serie arcuata prope marginem dorsalem tuberculorum compressorum in utraque valva ornata. Margo dorsi posticus elongatus, declivis, subrectus, anticus brevior, vix excavatus. Lunula et area postica distinctæ. Dentes cardinis circiter viginti. Pagina interna albo-margaritacea, margine inferiori intus tenuiter crenulato.

This species is ovately trigonal, sharply rounded at each end, rather compressed, very inequilateral and moderately solid. It is sculptured with numerous fine concentric liræ and closely packed minute radiating striæ, chiefly visible in the intervening grooves, and near the posterior dorsal margin in both valves some of the concentric liræ are thickened at the ends, forming a series of compressed tubercles, which mark off a smooth, lanceolate, posterior area. The dorsal margins meet almost at a right angle, the posterior being nearly straight, and the anterior also straight or very slightly concave. The ventral margin is gently curved. The umbones are small and curved over towards the front over an indistinct, small lunule, beyond which a faint groove radiates from the beaks to the anterior extremity. The hinge-teeth are moderately strong, about twenty in number, of which seven or eight are in front of the beaks and the rest behind. The interior is pearly white, and the lower margin is minutely crenate within.

Length 6 mm., height 5, diameter $3\frac{1}{2}$.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms: Pteropod ooze.

Only dead white valves were obtained, so it is impossible to describe the epidermis, which, however, in all probability, was of an ordinary character. The chief characters of this species are the concentric liræ, the radiating striæ, and the tubercles down the posterior slopes.

Nucula urugnayensis, Smith (Pl. XVIII. figs. 12–12*b*).

Nucula urguayensis, Smith, Ann. and Mag. Nat. Hist., 1880, ser. 5, vol. vi. p. 320.

Habitat.—Station 321, off Monte Video, at the mouth of the Rio de la Plata, in 13 fathoms; mud.

In describing this species I followed Hanley, whose excellent monograph of the Nuculidæ I then consulted, in regarding the longer side anterior, and that towards which the beaks incline posterior, which is the reverse of what has been done in the descriptions in this Report. The six specimens obtained by the Challenger are adult, and show that the species is constant in form and general facies. They are of the same olivaceous tint as the type, but exhibit at intervals rather more distinctly a few darker concentric zones where the valves are somewhat deeply furrowed at periods of arrested growth.

Nucula reticulata, Jeffreys.

Nucula reticulata, Jeffreys, Ann. and Mag. Nat. Hist., 1876, ser. 4, vol. xviii. p. 429.
Nucula reticulata, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 583, pl. xlvi. fig. 7.

Habitat.—Station 78, off San Miguel, Azores, in 1000 fathoms: volcanic mud.

It is on the authority of Dr. Gwyn Jeffreys, who has examined the few valves from this locality, and referred to them in the latter of the above works, that I designate these with this name, for I have not seen the types procured by the "Valorous" expedition. They agree very fairly with his description, but are more angular in front than the figure, of which the anterior margins do not slope to "a rather sharp point."

Nucula profundorum, n. sp. (Pl. XVIII. figs. 13–13*a*).

Testa rotundata, paulo inæquilateralis, modice convexa, pallide flavescens, nitida, tenuissime radiatim substriata, ad apicem marginemque inferiorem versus lævis. Linea cardinis fortiuscula, dentibus undenis in valva dextra novenisque in sinistra instructa. Pagina interna radiatim tenuissime lineata, margine externo minute lirato-denticulato circumdata.

Length 3 mm., height $2\frac{1}{2}$, diameter $1\frac{3}{4}$.

Habitat.—Station 246, Mid North Pacific, in 2050 fathoms; Globigerina ooze.

This species is very like the Atlantic *Nucula reticulata*, Jeffreys, but may, I think, be separated. It is perhaps a little rounder, slightly more equilateral, and much more finely striated, indeed, the striæ should rather be described as hair-like whitish lines.

Nucula (*Acila*) *mirabilis*, A. Adams and Reeve.

Nucula mirabilis, A. Adams and Reeve, Zool. Voy. "Samarang," p. 75, pl. xxi. fig. 8.
Nucula mirabilis, Hanley, in Sowerby's Thes. Conch., vol. iii. p. 155, pl. ccxxix. fig. 111.
Nucula mirabilis, Dunker, Index Moll. Japon., p. 238.
Nucula (*Acila*) *mirabilis*, H. and A. Adams, Gen. Moll., ii. p. 545.

Habitat.—Station 233A, off Kobé, Japan, in 8 to 50 fathoms (Challenger); Kieusieu, Nagasaki Bay (Adams and Reeve).

The single shell from Kobé is exceptionally large, being 30 mm. long and 21 in height.

Nuculina, d'Orbigny.

Nuculina ovalis (S. Wood) (Pl. XIX. figs. 1–1*b*).

Pleuradon ovalis, S. Wood, Ann. and Mag. Nat. Hist., 1840, vol. iv. p. 230, pl. xiii. fig. 1.
Nucinella miliaris, (Deshayes?) S. Wood, Monog. Crag Moll., vol. ii. p. 73, pl. x. figs. 4, *a–c*.

Testa parva, inæquilateralis, altior quam longa, irregulariter oblique ovata, solidiuscula, alba, lævis, striis incrementi sculpta. Margo dorsi infra umbones subhorizontalis, brevis, parum arcuatus. Latus anticum paulo supra medium angulatum, supra angulum obliquum, rectiusculum vel incurvatum, infra id leviter curvatum; posticum latissime arcuatum; inferius paulo excurvatum. Cardo validus, dentibus primariis 7–8 inæqualibus, in valva sinistra, lateralique elongato postico lamelliformi instructus. Pagina interna haud margaritacea, subnitida, cicatrice postica maxima notata, margine simplice, haud crenulato circumdata.

This little species is much higher than long, somewhat obliquely and irregularly ovate, moderately strong, not particularly convex, white, smooth, and sculptured with fine lines of growth. It is a trifle inequilateral, the umbones being located just a little behind the centre. The front side margin is at the upper part oblique, and almost straight, or even very faintly incurved, then rather suddenly angulated, the angle falling a little above the middle, beneath which it exhibits a faint curve. The posterior side forms one regular very gentle arcuation, and the basal outline is only a little more rounded. The hinge-plate is broad and in the left valve armed with seven or eight primary teeth, of which two anterior and three posterior are somewhat stronger than those intervening. They are prominent, pointed, separated by deep pits, and arranged in a slightly curved series. The lateral tooth on the posterior side is long and thin, and separated from the outer margin by a deep groove. The interior of the valves does not appear to be highly glossy or pearly, is smooth at the margin, and slightly thickened just within. The posterior muscular impression is remarkably large and situated low down beyond the lateral tooth.

Length $2\frac{1}{2}$ mm., height $3\frac{1}{2}$, probable diameter $1\frac{2}{3}$.

Habitat.—Simon's Bay, Cape of Good Hope, in 15 to 20 fathoms.

The above description is based upon the specimens obtained by the Challenger.

This is the first record, I believe, of the existence in a living state of this most interesting species. The genus is already known as recent, one species from the Catalina Islands having been described by Carpenter as *Nuculina munita*, and another from the Korean Straits by A. Adams under the name of *Huxleyia sulcata*.

Only three left valves of this species were obtained. They differ from Crag specimens in being larger, and consequently appear rather higher, as, with the growth of the shell, the height increases more than the length. The hinge-teeth are precisely the same in some of the fossil specimens, but usually appear to be somewhat fewer.

I am not quite convinced that the *Nucula miliaris* of Deshayes, from the Paris Basin, is the same species as the Crag shell. There appear to be certain differences in form, in the somewhat pearly interior and position of the ligament which distinguish the former.

Mr Searles Wood [1] does not assign any reason for abolishing his name *Pleurodon* and substituting for it that of *Nucinella*. It may have been that he found that the appellation *Pleurodonta* [2] had previously been employed in the Mollusca, and in his judgment that it too closely resembled the genus created by himself. Be that as it may, I do not think he was justified in assigning a new name to this genus, seeing that d'Orbigny in the meantime had suggested that of *Nuculina*.[3]

Leda, Schumacher.

Leda semen, n. sp. (Pl. XIX. figs. 2 2*a*).

Testa minuta, convexa, inæquilateralis, oblonga, antice acute rotundata, postice breviter rostrata, extremitatem versus radiatim impressa, incrementi lineis tenuiter striata, sordide albida. Margo dorsi anticus elongatus, leviter convexus et declivis, posticus brevior, primo rectiusculus, dein ad extremitatem curvatus. Margo inferior late arcuatus, postice leviter sinuatus. Umbones aliquanto prominentes, involuti, postice inclinati, postmediani. Linea cardinis mediocriter valida, dentibus novenis posterioribus, duodenisque anterioribus instructa. Fossa ligamenti triangularis, profunda.

This very small species is fairly solid, very inequilateral, elongate, sharply rounded at the anterior end and shortly beaked behind, the point, however, not being very acute. The valves exhibit a broad shallow depression down the posterior side, which causes, at that part, a faint sinuation in the otherwise regularly and broadly curved lower outline. The dorsal margin is oblique on both sides, slightly excurved in front, straightish at first behind, and then curving downwards to the extremity. The sculpture consists of very fine lines of growth only. The beaks are a little prominent, curve inwards towards one

[1] Monog. Crag Moll., vol. ii. p. 72 (1852–55).

[2] Fischer de Waldheim Mus. Demidof., iii. (1807).

[3] Palæont. Franç. Terr. Crét., t. iii. p. 161 (1843).

another, and have a posterior inclination. The hinge-plate is moderately strong, and furnished with about twenty-one teeth, of which about nine are in front of the small deep ligamental pit and twelve behind it. The interior is glossy, and the scars and pallial impression are not clear.

Length 3 mm., height 2, diameter $1\frac{1}{3}$.

Habitat.—Station 122, off Pernambuco, Brazil, in 350 fathoms; red mud.

Although so small, the shells here described appear to be adult. They are devoid of any special striking feature, but are peculiarly contracted and beaked at the posterior end.

Leda excisa (Philippi).

Nucula excisa, Philippi, Enum. Moll. Sicil., vol. ii. p. 46, pl. xv. fig. 4.
Malletia excisa, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 586.
Malletia excisa, Jeffreys, Ann. and Mag. Nat. Hist., 1876, vol. xviii. p. 435.

Habitat.—Station 70, west of the Azores, in 1675 fathoms; Globigerina ooze.

The sinus in the posterior side is not quite so marked in the two valves from this Station as in Philippi's figure.

Although stated to be wholly external by Jeffreys, I am of opinion that the valves are also connected by an internal cartilage, because I find a minute pit for its reception as in other species of *Leda* immediately under the apex of the umbones, and consequently have placed it in that genus.

Leda decipiens, n. sp. (Pl. XIX. figs. 3–3*a*).

Testa convexa, inæquilateralis, oblonga, antice angusta, acute rotundata, postice insigniter dilatata, quadrate oblique truncata et concave impressa, liris tenuibus numerosis regularibus ornata. Margo dorsi anticus leviter declivis, fere rectus, posticus longior, horizontalis, rectilinearis aut vix incurvatus. Margo ventris late arcuatus, antice lente adscendens, post medium maxime prominens. Umbones parvi, antemediani, læves. Linea cardinalis suberassa, lata, dentibus circiter triginta instructa. Lunula angusta, paulo impressa. Area posterior latior, profunda, acute marginata.

Length 10 mm., height 7, diameter $5\frac{1}{2}$.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

The slight broad depression down the posterior side causes the fine concentric liræ to be the least flexuose at that part, and the truncation consequently is not absolutely rectilinear. Of the thirty teeth about seventeen are posterior and thirteen anterior. The muscular scars and pallial line are not sufficiently clear for description.

This species has very much the form of *Nucula dilatata*, Philippi, a Sicilian Tertiary fossil, but appears to be more solid, more strongly striated, and has a well-marked dorsal area, and the posterior dilated side is not so perpendicularly truncate.

Leda inaudax, n. sp (Pl. XIX. figs. 4–4*a*).

Testa minuta, convexa, solida, triangulariter ovata, antice rodundata, postice cuneata, alba, concentrice tenuiter et regulariter lirata. Margo dorsi utrinque æqualiter valde declivis, antice vix excurvatus, postice in medio leviter concavus. Margo inferior late arcuatus, postice haud sinuatus. Umbones rotundati, paulo antemediani, incurvati, postice inclinati. Linea cardinis fortis, dentibus circiter octo utrinque instructa.

Length $2\frac{1}{2}$ mm., height $1\frac{2}{3}$, diameter $1\frac{1}{3}$.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

Although narrowed behind, this little shell has not a rostrate aspect, there being no incurvation of the ventral outline near the posterior extremity which is roundly pointed. Neither is there any radiating depression as in some allied forms, and the concentric lirae are fine and regular.

Leda confinis, n. sp. (Pl. XIX. figs. 5–5*a*).

Testa parva, solida, convexa, ovata, postice acuminata, breviter rostrata, impressionem radiantem latam exhibens. Valvæ nitidæ, flavescentes, incrementi lineis tenuissimis striatæ. Margo dorsi anticus declivis, arcuatus, posticus primo rectiusculus, obliquus, dein magis descendens. Margo inferior late curvatus, prope extremitatem posticam haud profunde sinuatus. Umbones subpellucidi, postice inclinati. Dentes fortes circiter 18–20 linea cardinali forti dispositi.

Length $3\frac{1}{3}$ mm., height $2\frac{1}{3}$, diameter $1\frac{3}{4}$.

Habitat.—Station 78, off the Azores, in 1000 fathoms; volcanic mud.

This species bears considerable resemblance to *Leda messanensis*, but does not attain so large a size. It is proportionally thicker, more convex, more inequilateral, the posterior end being considerably smaller than the anterior, which is rather less acutely rounded.

Leda solidula, n. sp. (Pl. XIX. figs. 6–6*a*).

Testa subtriangulariter ovata, postice acute sed breviter rostrata, solida, convexiuscula, æquilateralis, nitida, albida, concentrice subfortiter lirata, liris utrinque attenuatis

fere obsoletis. Margo dorsi anticus rectiusculus, declivis, posticus paulo magis obliquus, levissime excurvatus. Margo inferior antice inque medio arcuatus, prope extremitatem posticam ad terminum impressionis latæ ab umbone radiantis conspicue sinuatus. Area dorsi postica lata, porca rotundata marginata, prope medium porcam parvam minus conspicuam exhibens. Linea cardinis crassa dentibus ad 20 elongatis acutis munita.

This small species is about equilateral, ovate-triangular, rounded in front and acutely peaked behind. It is rather convex and solid, exhibits a shallow radiating depression down the posterior side, is whitish, glossy, and sculptured with rather strong concentric liræ which are attenuated and somewhat obsolete on both sides. The front dorsal margin is straightish and moderately oblique, the posterior a trifle more sloping and very faintly excurved, and the lower outline is gently convex in front and at the middle, but conspicuously sinuated at the beaked end. The hinge-plate is strong, and armed with about twenty long, sharp teeth, of which there are one or two more behind the cartilage-pit than in front.

Length $4\frac{1}{2}$ mm., height 3, supposed diameter of perfect shell $2\frac{1}{2}$.

Habitat.—Station 120, off Pernambuco, in 675 fathoms; red mud.

I have ventured to describe this species from a single valve only, as its form is peculiar, and the sculpture well marked.

Leda jeffreysi, Hidalgo.

Leda lata, Jeffreys, Ann. and Mag. Nat. Hist., 1876, vol. xviii. p. 431.
Leda jeffreysi, Hidalgo, Moll. Marin. Espana, p. 136; and Journ. de Conch., 1877, vol. xxv. p. 396.
Leda jeffreysi, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 579, pl. xlvi. fig. 2.
Leda jeffreysi, Dall, Bull. Mus. Comp. Zoöl., vol. ix., No. 2, p. 121.

Habitat.—Station 78, off the Azores, in 1000 fathoms; and Station 344, off Ascension Island, in 420 fathoms.

The specimens from the latter locality are more pointed anteriorly than those from Station 78, approaching in outline *Leda lenticula*, Möller, a nearly related species.

Leda hebes, n. sp. (Pl. XIX. figs. 7–7*a*).

Testa ovata, postice acuminata, antice acute rotundata, mediocriter convexa, inferne late curvata, nitida, alba, concentrice tenuiter striata. Margo dorsi anticus declivis, paulo convexus, posticus longior, subrectus, æqualiter obliquus. Lunula inconspicua, angusta, marginata; area postica latior, utrinque carinata, carina altera graciliori utrinque medium instructa. Linea cardinis modice valida, dentibus circiter decem anterioribus, tredecimque posticis instructa.

This species is transversely ovate, sharply rounded in front, produced and acuminate behind. It is considerably inequilateral, moderately convex, transparent white, glossy near the umbones, finely concentrically striated beneath. The dorsal margins are about equally oblique, the anterior being the least convex, the posterior longer and almost rectilinear, or the least concave after a slight rise near the umbones. The beaks are small, but little raised and glassy. The hinge-plate is fairly strong, and armed with about ten teeth in front of the centre, and thirteen behind. The lunule is not easily seen, but is very narrow and margined by a slender ridge. The posterior area is much larger, well-defined by a ridge radiating from the umbones to the extremity, and has an inner keel on each side nearer the centre enclosing a space only a trifle larger than the lunule.

Length 4 mm., height $2\frac{1}{2}$, diameter $1\frac{1}{2}$.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

Leda despecta, n. sp. (Pl. XIX. figs. 8–8*a*).

Testa parva, rotunde subovata, inæquilateralis, convexa, albida, concentrice fortiter striata, striis pone medium evanidis. Margo dorsi anticus brevis, leviter declivis, curvatus, posticus longior, parum obliquus, subrectus. Latus anticum acute rotundatum, posticum latius. Umbones rotundati, obtusi, antemediani. Linea cardinis subvalida, dentibus ad sedecim instructa.

This little species is peculiar on account of its rounded *Pisidium*-like form, and the rather strong, concentric striæ, which become obsolete a little behind the centre of the valves, and very feeble close to the anterior side. It is a little longer than high, rather convex, white, glossy, somewhat inequilateral, narrower and more sharply rounded in front than behind, and prominently curved beneath. The front dorsal margin is short, slightly curving and oblique, the posterior being longer, straighter, and also a little sloping. The beaks are rounded and rather blunt, and decidedly in front of the centre. The hinge-plate is rather broad, and the teeth, of which about nine are behind and seven in front of the beaks, are strongish.

Length $2\frac{1}{4}$ mm., height $1\frac{3}{4}$, diameter 1.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

This species probably attains a larger size than that of the shells here described.

Leda lata (Hinds).

Nucula lata, Hinds, Proc. Zool. Soc. Lond., 1843, p. 99.
Nucula lata, Hinds, Zool. Voy. "Sulphur," p. 64, pl. xviii. fig. 10.
Leda lata, Hanley, in Sowerby's Thes. Conch., vol. iii. p. 116, pl. cexxvii. figs. 44, 45
Leda lata, Sowerby, Conch. Icon., vol. xviii. pl. vii. figs. 44, *a*, *b*.

Habitat.—Station 189, Arafura Sea, in 25 fathoms; green mud.

The young shells obtained by the Challenger are not so pointed behind as adult specimens, and the area between the posterior radiating keels is much smoother and the carinæ themselves are not notched. The concentric striæ in this species are coarser near the umbones, on the hinder side of which, in a slight depression, they are somewhat flexuose.

Leda inopinata, n. sp. (Pl. XIX. figs. 9–9*a*).

Testa parva, ovata, convexiuscula, postice brevissime rostrata, fere æquilateralis, radiatim tenuiter lirata, lineis incrementi sculpta, albida; margo dorsi utrinque leviter arcuata, parum declivis; margo inferior late curvatus, prope extremitatem posticam sinuatus. Cardo validus, dentibus denis utrinque munitus.

This little species is ovate, rounded in front, and shortly beaked behind. It is whitish, equilateral, moderately convex, and sculptured with numerous, slender, radiating liræ, some of which bifurcate towards the lower margin. They do not extend to the beaked end of the valves, but are there replaced by a number of fine, irregular wrinkles. The whole surface exhibits fine lines of growth, some of them being particularly well marked. From the umbones a distinct ridge extends to the extremity of the short rostrum, in front of which the valves are depressed, so that the broadly curved ventral outline is shallowly sinuated at this point. The dorsal margin is only slightly convex on each side, and very gently sloping, and the umbones are smooth at the tip, small, central, and not much produced. The hinge is rather strong, and bears on each side ten long, acute teeth. The cartilage-pit is broad and triangular.

Length $3\frac{2}{3}$ mm., height $2\frac{1}{2}$, diameter 2.

Habitat.—Station 164, off Sydney, Australia, in 950 fathoms; green mud.

This is unlike any species of the genus with which I am acquainted, and remarkable for the radiating liræ which cover the surface

Leda micans, Adams.

> *Leda micans* (Adams MSS.), Hanley, in Sowerby's Thes. Conch., vol. iii. p. 130, pl. ccxxix. fig. 100.
> *Leda micans*, Sowerby, Conch. Icon., vol. xviii. pl. vi. fig. 39.

Habitat—Off Levuka, Fiji Islands in 12 fathoms.

New Zealand is the only locality hitherto assigned to this species, and that has not since been confirmed by Hutton (*cide* Manual New Zeal. Moll., p. 165).

Leda crassa (Hinds).

Nucula crassa, Hinds, Proc. Zool. Soc. Lond., 1843, p. 99.
Leda crassa, Hanley, in Sowerby's Thes. Conch., vol. iii. p. 120, pl. cexxviii. fig. 69.
Leda crassa, Angas, Proc. Zool. Soc. Lond., 1877, p. 193.
Leda crassa, Sowerby, Conch. Icon., vol. xviii. pl. v. fig. 27.

Habitat.—Station 161, off the entrance to Port Philip, South Australia, in 38 fathoms (Challenger); Australia (Hinds); Port Jackson Heads, in 25 fathoms (Angas); Van Diemen's Land (Mus. Cuming).

A single valve only, half the length of that figured by Hanley, is all that was dredged off Port Philip. It undoubtedly belongs to the same species as the type and two specimens from Sydney presented to the British Museum by Mr. Angas.

Leda messanensis, Seguenza.

Leda acuminata, Jeffreys, Ann. and Mag. Nat. Hist., 1870, vol. vi. p. 69.
Leda acuminata, Seguenza, Atti R. Accad. dei Lincei. Mem., 1877, vol. i. p. 1175. pl. iii. figs. 15–15*c*.
Leda messanensis (Seguenza, MSS.), Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 576.

Habitat.—Station 75, off Fayal, Azores, in 450 fathoms; and Station VIII., off Gomera, Canaries, in 620 fathoms.

The largest specimen from Station 75 is 7 mm. in length, showing that the species attains a considerably larger size than the dimensions given by either Jeffreys or Seguenza.

? *Leda rectidorsata*, Seguenza.

Leda (*Junonia*) *rectidorsata*, Seguenza, Atti R. Accad. dei Lincei Mem., 1877, vol. i. p. 1176, pl. iv. figs. 19–19*d*.

Habitat.—Station II., Setubal, in 470 fathoms.

A single valve from this locality agrees so closely with fig. 19*b* in Seguenza's work, that I cannot find any grounds for separating it.

Leda noræ-guineensis, n. sp. (Pl. XIX. figs. 10–10*a*).

Testa elongato-ovata, postice acuminata, unicarinata, carina aream dorsalem circumdante, antice anguste rotundata, æquilateralis, alba, modice convexa, concentrice striata, striis paulo post medium fere evanidis, antice prope extremitatem acutam paulo flexuosis.

Lunula angustissima, elongata, vix impressa, angulo levi circumscripta, prope medium prominens. Area latior, profundior, striata, in medio linea impressa arcuata notata. Dentes ad 34, acuti, erecti.

This species is of an elongate-oval form, but produced to an acute point behind. It is about equal-sided, not particularly convex, white and glossy. The valves are of moderately strong texture, exhibit a slightly curved keel behind, defining the dorsal area, and are sculptured with fine concentric striæ, which are rather deeper towards the carina than on the anterior side, and are more or less interrupted for a small space a little in front of the middle, the surface, in consequence, at this part being conspicuously smooth and glossy. The striæ just in front of the keel ascend somewhat suddenly, and appear a little irregular owing to a very faint depression at this point. The dorsal margins are about equally sloping, the front one being a little convex, the posterior a trifle excavated at first, then prominent, and again concave at the end. The lunule is very narrow, defined by a slight ridge, striated and slightly impressed. The area is much broader, strongly striated, deep at the surrounding keels, prominent along the middle, and exhibits on each side of it a second fainter ridge, enclosing a space about the size of the lunule. The teeth are sharp, erect, and about thirty to thirty-four in number, of which a small majority are in front of the small triangular ligament-pit.

Length 7 mm., height 4, diameter 3.

Habitat.—Station 188, south of New Guinea, in 28 fathoms; green mud.

This species is a more finely sculptured shell than *Leda rentricosa*, Hinds, not so acuminate behind, and is peculiar on account of the cessation of the striæ near the middle of the valves.

Leda watsoni, n. sp. (Pl. XIX. figs. 11–11*a*).

Testa parva, alba, subæquilateralis, ovata, antice acute rotundata, postice acuminata et bicarinata, inter carinas concava, concentrice lirata, liris tenuibus, fere æqualibus, interstitiis gracilioribus, ad impressionem flexuosis. Margo dorsi anticus paulo declivis, leviterque excurvatus, posticus longior, fere rectilinearis, æque obliquus; margo inferior late arcuatus, pone carinam anticam aliquanto emarginatus. Lunula angustissima, linearis; area postica latior, lanceolata, impressa, in medio prominens, prope medium linea elevata paulo arcuata utrinque instructa. Dentes ad 24, mediocriter validi.

This species is of an elongate, trigonally ovate form, sharply rounded in front, and terminating behind in an acute point. It is white, glossy, moderately convex, and almost equilateral, the posterior side being only very slightly longer than the anterior. The valves exhibit two distinct and slightly arcuate keels at the hinder end, one running from the beaks to the acute extremity, and the other a little below it, the space between being conspicuously concave. The sculpture consists of fine, regular,

concentric lirae, which appear rather sharper between the carinae than upon the rest of the surface. The dorsal margins are not very sloping, the front one being slightly arcuate, the posterior nearly rectilinear, and the lower outline is regularly widely curved, but faintly sinuated between the keels. The lunule is indistinct, and consists of a very narrow, linear space, bordered on each side by a very small slender lira. The posterior area, on the contrary, is large, limited by the upper of the lateral keels, near which it is concave, and striated by the very fine termination of the concentric lirae. It is raised, along the central line, on each side of which it exhibits a very slender, elevated, arcuate raised line. The interior is glossy, and the outer margin is marked with a very small indistinct denticle, indicating the termination of the lower carina. The teeth are fairly strong and about twelve on each side.

Length 5 mm. height 3, diameter 2.

Habitat.—Station 185, east of Cape York, North Australia, in 135 fathoms; coral sand.

This species must not be confounded with the young of *Leda chuva*, from which it differs in the straighter posterior dorsal margin, finer sculpture, more raised lower keel, and different dorsal area.

Leda ensicula, Angas.

Leda ensicula, Angas, Proc. Zool. Soc. Lond., 1877, p. 177, pl. xxvi. fig. 27.

Habitat.—Station 161, off the entrance to Port Philip, South Australia, in 33 fathoms; sand.

The type of this remarkable species, presented to the British Museum by Mr. Angas, was dredged off Port Jackson Heads, in 45 fathoms, by Mr. John Brazier of Sydney. Its form is so peculiar, and the description given by Angas so good, that there is little fear of its being confounded with any other species. I may mention that the teeth, which are not referred to by Angas, are elongate, very acute, and numerous, especially on the rostrate side.

Leda corbuloides, n. sp. (Pl. XX. figs. 1–1*a*).

Testa triangulariter ovata, crassiuscula, pallide flavescens, æquilateralis, antice breviter arcuata, postice acuta, impressionem radiantem haud profundam prope extremitatem exhibens, transversim fortiter lirata, antice liris 2–3 obsoletis radiantibus inter costas ornata. Margo dorsi anticus rectiusculus, obliquus, posticus leviter concavus, æque declivis; margo ventris late curvatus, postice ad impressionem breviter sinuatus. Lunula elongata, anguste elliptica, impressa, radiatim tenuiter lirata; area valde latior, acute ovalis, similiter lirata, porca rotundata circumdata. Linea cardinalis valida, dentibus quindenis utrinque instructa.

This is a solid, dirty whitish, little species, equilateral, fairly convex, of a triangularly ovate form, rather sharply rounded in front, and acutely, but shortly, rostrate behind. The valves exhibit a shallow radiating depression down the posterior side, which is defined in front by a faint ridge, and causes a feeble emargination in the otherwise regularly and broadly curved lower margin. The sculpture consists of numerous strong concentric riblets, which are furthest apart towards the beaks, and gradually approximate as the shell increases. They become slender by degrees at the sides, and in a great measure terminate at the rounded ridges which border the lunule and area. In addition to the costæ there are two or three faint radiating irregular liræ between the ribs which run from the umbones to the anterior end of the ventral outline. The lunule is long, narrowly elliptical, and somewhat sunken, whilst the area is much broader and sharply oval, both being ornamented with fine radiating liræ, the continuations of some of the concentric riblets. The dorsal margins are about equally oblique, the anterior being nearly rectilinear, and the posterior a little concave. The hinge-plate is rather strong, and furnished with about fifteen teeth on each side the minute central cartilage-pit. Interior glossy, thickened.

Length $6\frac{1}{2}$ mm., height $5\frac{1}{3}$, diameter $3\frac{1}{2}$.

Habitat.—Station 188, south of New Guinea, in 28 fathoms; green mud.

In general appearance this species closely resembles *Leda ventricosa* of Hinds, but may be distinguished from it by its smaller size, comparatively greater solidity, the more distant riblets upon the umbones, the more distinct impressed ray, and the absence of the puckers or nodules on the lunule.

Leda navæformis, n. sp. (Pl. XX. figs. 2–2*a*).

Testa parva, elongata, postice anguste rostrata et bicarinata, parum convexa, valde inæquilateralis, concentrice tenuiter striata. Margo dorsi anticus brevis, valde curvatim declivis, posticus elongatus, minus obliquus, concavus. Margo ventris antice et in medio late arcuatus sub rostrum leviter incurvatus. Dentes ad triginta, insigniter cavi. Pagina interna nitida, per medium rostri porcata.

This species is elongate, slenderly beaked behind, rather compressed, very inequilateral, white and sculptured with fine concentric striæ. From the beaks two keels run to the rather squarely truncate end of the rostrum, the space between them and between the upper one and the dorsal margin being concave. The front dorsal slope is short, very much curved and very oblique, the posterior, on the contrary, being long, concave, and less sloping. The anterior end is sharply rounded, the lower outline broadly arcuate in front and along the middle, but feebly incurved at the rostrate extremity. The umbones are small, and situated at about two-fifths of the total length

from the anterior end. The hinge-teeth are about thirty in number and remarkably excavated on the outside, those on the longer side being rather more numerous than those on the anterior margin, only extending along a trifle more than half its length. The interior of the valves is glossy, and along the middle of the rostrum exhibits a slight curved ridge.

Length $5\frac{1}{3}$ mm., height $2\frac{3}{4}$, diameter $1\frac{2}{3}$.

Habitat.—Station 185, east of Cape York, North Australia, in 135 fathoms; coral sand.

Externally this curious little shell recalls to mind certain little rostrate forms of the genus *Neæra*.

Leda ramsayi, n. sp. (Pl. XX. figs. 3–3*a*).

Testa elongata, antice acute rotundata, postice producta, anguste rostrata, compressa, valde inæquilateralis, bicarinata, carinis ab umbonibus ad extremitatem posticam decurrentibus, concentrice subfortiter lirata, liris supra carinam inferiorem subito angulatis. Margo dorsi anticus leviter convexus, valde declivis, posticus fere duplo longior, incurvatus, minus obliquus. Ventris margo late arcuatus, postice haud profunde sinuatus. Area postica dorsalis lanceolata, concava, incrementi lineis tenuissimis striata, carina superiori filiformi marginata. Umbones læves, nitidi, longe ante medium collocati. Dentes numerosi, conferti, angulares. Pagina interna nitida, ad extremitatem rostri porca mediani brevi instructa.

This species is rather longly rostrate behind and sharply rounded in front. It is very inequilateral, the acute smooth umbones being situated at about one-third of the entire length of the shell from the anterior end. The front dorsal slope is short, very oblique, and somewhat excurved, the posterior, on the contrary, being very long, less sloping, and gently concave. The lower outline forms a broad curve with a very faint sinuation near the hinder shortly truncate end. The valves have two radiating ridges, whereof the upper is slender, keel-like, and extends from the apex to the upper corner of the rostrate extremity, the lower being rounded, broader, and descending to the inferior angle. The sculpture consists of rather strong concentric lirae, which are suddenly turned at right angles upon the slightly concave space between the radiating keels, and, owing to the produced character of that side of the valves, are further apart than on the other portion of the surface. The hinder dorsal area is concave, almost smooth, and sharply defined by the uppermost carina. The teeth are numerous, close-set, and angular, those on the posterior side extending along two-thirds of its length. Along the middle of the rostrate end internally is a short curved ridge.

Length 7 mm., height 4, diameter 2 .

Habitat.—Station 164, off Sydney, New South Wales, in 950 fathoms; green mud.

Yoldia, Möller.

Yoldia lischkei, n. sp. (Pl. XX. figs. 4–4*b*).

Testa mediocriter convexa, tenuis, paulo inæquilateralis, oblonga, utrinque hians, antice acute rotundata, postice sursum subrostrata et radiatim haud profunde impressa, incrementi lineis tenuibus, hic illic paucis fortioribus, sculpta, epidermide flavescenti-olivacea, colore saturatiori sparsim zonata, amicta. Margo dorsi anticus declivis, leviter arcuatus, posticus longior, fere horizontalis, paulo concavus. Margo ventris late arcuatus, integer. Lunula elongata, angusta, impressa, in medio prominens. Area postica latior, in medio producta, margine acuto circumdata. Umbones parum elevati, paulo antemediani, postice inclinati. Linea cardinalis mediocriter fortis, dentibus numerosis erectis instructa. Fossa ligamenti lata, haud profunda, inferne arcuatim marginata. Pagina interna alba, concentrice plus minusve pellucido-cæruleo zonata. Sinus pallii profundus, latus, rotundatus, paulo ante medium extendens.

Length 29 mm., height 17, diameter 11.

Habitat.—Station 232, off Inosima, Japan, in 345 fathoms; green mud.

This species very closely resembles *Yoldia japonica* of Adams and Reeve, but is, I think, distinct.

That species is a smoother shell, of a paler colour, more convex, more inequilateral, the posterior side being longer in proportion to the anterior; also it is not so high, and consequently has a longer and more cylindrical appearance. The present species has a faint radiating depression down the hinder side, which does not exist in *Yoldia japonica*, the posterior dorsal area is more prominent along the middle, and the ligament-pit is broader, not so deep, and less projecting inwards. From a conchological point of view, the genera *Leda* and *Yoldia* appear to pass gradually into one another, the extent of the gape at one or both ends, the depth of the pallial sinus, &c., varying to any extent in a large number of species.

Yoldia isonota, Martens (Pl. XX. figs. 5–5*b*).

Yoldia isonota, Martens, Sitzungsb. Geselisch. naturf. Freunde, Berlin, 1881, p. 79.

Testa transversa, convexa, æquilateralis, antice acute rotundata, postice superne subnasuta, in medio sinuata, impressione radiante notata, incrementi lineis costiformibus in impressione posteriori flexuosis sculpta, epidermide crassiuscula, flavo-olivacea, supra costellis saturatissima, induta. Margo dorsi utrinque vix declivis, postice rectus, antice levissime excurvatus. Margo ventralis late arcuatus. Lunula nulla. Area postica aliquanto indistincta, leviter impressa, elongata, angusta. Linea cardinis mediocriter valida, dentibus ad septendecim acutis utrinque munita. Fossa ligamentalis profunda, paulo intus projecta. Pagina interna nitida, iridescens, albido cæruleoque zonata, plus minusve flavo tincta.

This species is considerably swollen, almost exactly equilateral, scarcely gaping at either end, elongate, nearly twice as long as high, sharply rounded at the anterior end, broader behind and shortly rostrate above, with a distinct but not very deep sinus just beneath, which marks the termination of a slight depression extending from the umbones. It is ornamented at intervals with very strong raised ridges, marking periods of growth, so that the surface might be described as ridged and sulcated. The epidermis is thickish, of a dark olive tint upon the lirae, paler and yellower between them. The dorsal margin is only very little sloping on both sides, quite rectilinear behind, and very slightly excurved in front. The umbones are small, central, and but very little raised above the dorsal line. The hinge-plate is not remarkably strong, and in the largest specimen bears seventeen sharp close-set teeth on each side the ligament-pit, which is deep and a little prominent within the valves. The interior is glossy, somewhat iridescent, whitish, zoned with a bluish tint, and stained at times with a pale reddish or yellowish colour. The pallial sinus is short, narrow, and rather acute.

Length 24 mm., height 13, diameter 12.

Habitat.—Balfour Bay, in 20 to 60 fathoms; Betsy Cove, in 15 to 25 fathoms; Howe's Foreland, in 95 fathoms; and Station 149c, in 110 fathoms: all off Kerguelen Island.

This species cannot be conveniently compared with any at present known. The specimens described by Professor Martens were rather smaller than the largest obtained by the Challenger.

Yoldia subæquilateralis, Smith.

Yoldia subæquilateralis, Smith, Ann. and Mag. Nat. Hist., 1875, vol. xvi. p. 73.
Yoldia subæquilateralis, Smith, Phil. Trans. Roy. Soc., 1879, vol. clxviii. p. 187.

Habitat.—Station 149D, Royal Sound, Kerguelen Island, in 28 fathoms: volcanic mud.

Besides the internal cartilage, the valves are connected above by a slight external ligament or thickening of the epidermis on each side of the umbones, which are generally eroded. The species is characterised by its compressed form, its gaping ends, and few teeth. The interior is bluish-white, zoned with a darker tint.

Sarepta, A. Adams.

Sarepta abyssicola, n. sp. (Pl. XX. figs. 6–6*b*).

Testa tennis, parva, inæquilateralis, antice angusta, acute rotundata, postice latior, nitens, alba, aliquanto iridescens, incrementi lineis tenuissimis sculpta. Margo dorsi anticus brevis, paulo excurvatus et declivis, posticus parum arcuatus, minus obliquus. Ventris margo late curvatus, antice oblique ascendens, postice subito sursum arcuatus.

paulo post medium maxime prominens. Umbones haud acuti, parum producti, antemediani. Linea cardinis gracilis, debilis, dentibus 8–9 utrinque instructa. Ligamentum fuscescens, brevis, partim externum, partim marginale.

This small species is very thin, rather convex, considerably inequilateral, of an irregular ovate form, narrower in front than behind, white, very glossy, a little iridescent, and sculptured with excessively fine lines of growth. The front dorsal slope is short, the least convex, and a little oblique, the posterior being longer, also faintly arcuate, but rather less sloping. The ventral outline is gently rounded, slowly upcurving in front, and together with the dorsal margin forms a sharply rounded extremity. The lower margin is most prominent a trifle behind the middle of the valves, and rises posteriorly more suddenly than in front. The umbones are bluntly rounded, only slightly elevated, and situated at about a third of the total length from the anterior end. The hinge-plate is slender, and furnished with about eight or nine blunt-topped teeth on each side, a small space under the beaks being edentulous. The ligament is small, brown, partly internal in a small pit beneath the umbones, and partly visible externally, being located in a groove on the margin of the valves behind the beaks. The interior is smooth, and the muscular scars are not clearly discernible.

Length $4\frac{1}{2}$ mm., height $3\frac{1}{3}$, diameter $2\frac{1}{3}$.

Habitat.—Station 246, Mid North Pacific Ocean, in 2050 fathoms: and Station 281, Mid South Pacific, in 2385 fathoms.

The specimen from the latter locality apparently belongs to this species, differing but very slightly in being the least more strongly concentrically striated. In the typical form of this genus, *Screpta speciosa*, A. Adams, I also find a slight marginal ligament besides the more distinct internal cartilage.

Malletia, Desmoulins.

Malletia gigantea, Smith.

Solenella gigantea, Smith, Ann. and Mag. Nat. Hist., 1875 (July), p. 72.
Solenella gigantea, Smith, Phil. Trans. Roy. Soc., 1879, vol. clxviii p. 187, pl. ix. fig. 19.

Habitat.—Betsy Cove, Kerguelen Island, in shallow water: also at Balfour Bay, in 20 to 60 fathoms.

A fine species, easily recognised by its large size, its form, and the few closely ranged radiating striæ upon the anterior side.

Malletia arronana, n. sp. (Pl. XX. figs. 7–7*b*).

Testa oblonga, subquadrata, valde inæquilateralis, tenuis, convexa, antice oblique-curvata, postice arcuatim truncata, radiatim obsolete bisulcata, epidermide tenui dilute

olivacea induta. Superficies nitida, incrementi lineis, in medioque aliis paulo obliquis sculpta. Margo dorsi anticus brevis, leviter declivis, rectiusculus, posticus vix obliquus, levissime incurvatus. Margo ventralis late arcuatus antice curvatim ascendens. Umbones paulo prominentes, latus anterius versus inclinati, in $\frac{1}{3}$ longitudinis collocati. Lunula angustissima, impressa; area postica angusta, utrinque bicarinata. Linea cardinis gracilis, dentibus numerosis instructa. Pagina interna nitens, caeruleo-albida, lineam pallii mediocriter profunde sinuatam exhibens. Ligamentum olivaceo-fuscum, prominens.

This interesting species is rather thin, convex, markedly inequilateral, of an oblong, squarish form, especially at the posterior side, which is obliquely and slightly arcuately truncate. Down the posterior side two faint depressions radiate from the umbones, the one to the lower rounded extremity, the other to the middle of the truncated side. The epidermis is glossy, thin, of a pale olive tint, and exhibits rather strong lines of growth, especially in front, and on the central portion of the valves other elevated thread-like lines crossing them obliquely. These slanting lines are not present in the early stages of growth. The front dorsal margin is short, nearly rectilinear, and just a little oblique, the posterior being much longer, nearly horizontal, and very slightly incurved. The lower outline is very gently arcuate, and rises more gently in front than behind. There is a very narrow lunule, which is sunken and well defined. The posterior dorsal area is also narrow, excavated, bounded by a raised slender ridge, and has a slender thread-like keel on each side, mid-way between the central divisional line and the outer ridges. The umbones are a little raised above the dorsal line, incline towards the front, a trifle incurved, and located at about one-third of the entire length of the shell from the anterior end. The hinge-plate is rather slender, and bears (in the largest specimen under examination) about fifty-five not very long teeth, of which about fourteen are in front of the umbones. The ligament is prominent and of a brownish-olive tint. The interior is glossy, bluish-white, and on account of the thinness of the shell exhibits more or less of concentric sulcation, corresponding to the external ornamentation. The pallial sinus is moderately deep, not reaching to the centre, and sharply rounded at the end.

Length $20\frac{1}{2}$ mm., height $12\frac{1}{2}$, diameter 8.

Habitat.—Station 191, near the Arrou Islands, in 800 fathoms; green mud.

Malletia obtusa, G. O. Sars.

Malletia obtusa, G. O. Sars, Moll. Reg. Arct. Norv., p. 41, pl. xix. figs. 3, *a*, *b*.
Malletia obtusa, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 586.
Yoldia obtusa, Sars, Remark. Forms Animal Life, p. 23, pl. iii. figs. 16–20.
Yoldia abyssicola, Sars, Forhandl. Vidensk. Selsk. Christiania, 1858, p. 86.

Habitat.—Station 47, south of Nova Scotia, in 1340 fathoms; and Station 45, off the east coast of the United States, in 1240 fathoms.

Several Stations in the Atlantic have already been recorded by the late Dr. Gwyn Jeffreys for this species.

Malletia pallida, n. sp. (Pl. XX. figs. 8–8*a*).

Testa convexiuscula, inæquilateralis, angusta, elongata, antice acute rotundata, postice angustior, subacuminata, nitida, albido-flavescens, incrementi lineis tenuibus striata, lineis paucis albidis radiantibus ornata. Margo dorsi anticus leviter declivis, parum arcuatus, posticus longior, rectilinearis, vix obliquus. Margo inferior late curvatus, postice indistincte sinuatus. Umbones parum prominentes, haud acuti, involuti. Ligamentum elongatum, gracile, vix prominens, pone umbones carina gracillima utrinque marginatum. Linea cardinis angusta, dentibus ad 36 instructa. Pagina interna alba.

This species is thin, inequilateral, moderately convex, very glossy, white, and clothed with a very thin pale yellow epidermis. It is long, sharply rounded at the anterior end, narrowed and bluntly acuminate behind. The sculpture consists of very fine lines of growth and a few coarser striæ near the lower margin at the central part of the valves, and at the posterior end there are two faint radiating white lines and a few others still less noticeable upon the rest of the surface. The front dorsal margin is a little convex and oblique, the posterior being considerably longer, rectilinear, and about equally inclined. The ventral outline is regularly broadly curved, and exhibits only the faintest indication of a posterior emargination. The umbones are small, incurved at the tips, a little raised above the dorsal line, and situated at about three-eighths of the total length from the anterior end. The ligament is small, narrow, and bordered on each side by the raised keel-like posterior edge of the valves. In front of the beaks there is also a slight ligament or thickening of the epidermis which connects the valves. The hinge-plate is moderately slender, and furnished with about thirty-six denticles, of which about twelve are anterior to the centre. The interior is white, and exhibits only a shallow sinus in the pallial impression.

Length 16½ mm., height 9½, diameter 6.

Habitat.—Station 137, Mid South Atlantic, between Tristan da Cunha and the Cape of Good Hope, in 2550 fathoms; red clay.

Malletia veneriformis, n. sp. (Pl. XX. figs. 9–9*a*).

Testa ovata, convexa, paulo inæquilateralis, alba, nitida, concentrice tenuiter lirata et sulcata. Umbones prominentes, incurvati, antice versi. Dentes numerosi, utrinque elongati, acuti, in medio umbones infra minuti, haud interrupti. Ligamentum marginale, angustum, in sulco supra dentes parvos, infra umbones situm.

This species is shaped not unlike certain forms of *Cytherea*. It is rather inequilateral, ovate, somewhat convex, semitransparent white, and sculptured with regular fine concentric lirae and intervening slender sulci. The front dorsal margin is almost straight, and considerably oblique, the posterior being almost equally sloping, longer, and a trifle more curved. The lower outline is gently arcuate and about equally ascending at both ends, which are sharply rounded. The umbones are prominent, incurved, smooth, glassy, and anteriorly inclined. The hinge-teeth, about thirty in number, form one unbroken series from side to side, those in the centre under the umbones being minute, whilst those at the sides are very long, erect, and acute. Owing to the semitransparent texture of the shell, the pits for the reception of the corresponding teeth in the two valves are distinctly seen on both the front and hinder dorsal areas. The ligament is small, and placed in a narrow groove between the small teeth just behind the tip of the beaks and the dorsal edge, and is probably only very little, if at all visible externally. The interior of the valves is smooth and highly glossy.

Length 8 mm., height 6½, diameter 4.

Habitat.—Station 33, off Bermuda, in 435 fathoms; also Station 24, off Culebra Island, West Indies, in 390 fathoms.

On account of the glossy surface, the pallial line of this species is very indistinct. It is very unlike the typical forms of *Malletia* in texture, form, and sculpture, and it is questionable whether, in the living state (all the specimens under examination being dead, separated valves), it is furnished with a similar kind of epidermis. As, however, the hinge-characters are the same, it seems to me advisable at present to locate it in this genus.

Malletia cuneata, n. sp. (Pl. XX. figs. 10–10*a*).

Testa parva, modice convexa, subovata, antice acute rotundata, postice angustata, acuminata, alba, concentrice tenuiter striata, striis latus posterius versus paulo evanidis. Margo dorsi anticus brevis, arcuatim descendens, posticus longior, declivis, minime excurvatus. Margo ventralis late rotundatus, postice perindistincte sinuatus. Umbones prominentes, antemediani, involuti, haud acuti, antice inclinati. Linea cardinis mediocriter valida, serie continua dentium ad triginta instructa, paucis prope umbones minimis.

This small species is considerably inequilateral, broader in front than behind, where it is somewhat acuminately produced, rather convex, white, and sculptured with fine concentric striæ, which become less apparent towards the hinder extremity. The dorsal margin is somewhat oblique on both sides, the anterior portion being gently arcuate, the posterior almost twice as long and rather straighter. The ventral outline is widely

curved, sometimes, but not always, with the faintest trace of a sinus behind, indicating a very inconspicuous radiating depression upon the surface of the valves. The umbones are prominent, smooth, incurved, directed towards the front, and situated considerably in advance of the centre. There is neither lunule nor posterior area. The hinge-plate is fairly strong, broader in front than behind, and supports an unbroken series of about thirty teeth, of which ten are anterior to the beaks. The central denticles are small, but the laterals are fairly long and acute. The ligament is placed in a small narrow groove above the teeth, just behind the apices. The scars and pallial line are indistinct.

Length 5 mm., height 4, diameter 3.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

This is a much more slender species than *Malletia reneriformis*, much narrower posteriorly, and more finely sculptured. The hinge-characters of both, however, are alike.

Family Arcidæ.

Subfamily Pectunculinæ.

Glomus, Jeffreys.

Glomus nitens, Jeffreys.

Glomus nitens, Jeffreys, Ann. and Mag. Nat. Hist., 1876, vol. xviii. p. 433.
Glomus nitens, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 573, pl. xlv. fig. 5.

Habitat.—Station 323, off the Rio de la Plata, in 1900 fathoms; blue mud.

This species has been recorded by the late Dr. Jeffreys from several stations in the North Atlantic, at depths of from 500 to 1750 fathoms, but this is its first occurrence so far south.

The cartilage is placed in a narrow groove parallel with the hinder dorsal margin, which extends from the umbones a short distance under the teeth on that side.

Glomus jeffreysi, n. sp. (Pl. XXI. figs. 1–1*b*).

Testa minuta, tenuissima, mediocriter convexa, æquilateralis, subcircularis, postice oblique subtruncata, ibique impressione radiante haud profunda exhibens, albo-pellucida, nitida, incrementi lineis tenuissimis sculpta. Umbones parvi, paulo supra marginem projecti, haud acuti. Linea cardinis mediocriter valida, dentibus circiter sedecim (quorum sex ante medium cæterique postmediani sunt) instructa. Ligamentum angustum, in fossa obliqua umbones infra locatum.

Length $2\frac{1}{4}$ mm., height $1\frac{3}{4}$, diameter 1.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

This species is very like *Glomus nitens* in some respects, but is well distinguished by the shallow depression down the posterior side, which causes the margin at that part to be somewhat truncate or even faintly incurved.

Glomus simplex, n. sp. (Pl. XXI. figs. 2–2*b*).

Testa ovato-circularis, fere æquilateralis, tenuis, paulo convexa, albida, subpellucida, nitida, incrementi lineis tenuibus striata. Umbones parvi, leviter supra marginem producti. Linea cardinis angusta, dentibus anticis ad novem posticisque circiter quindecim instructa.

Length $4\frac{1}{2}$ mm., height $3\frac{1}{2}$, diameter 2.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

This species in texture, sculpture, and the hinge-characters closely resembles *Glomus nitens*, but is distinguishable by its different form, being more ovate or longer in proportion to its height.

Glomus inæquilateralis, n. sp. (Pl. XXI. figs. 3–3*b*).

Testa minuta, obtuse ovata, mediocriter convexa, tenuis, inæquilateralis, albida, incrementi lineis tenuibus sculpta. Margo dorsi anticus brevis, declivis, rectiusculus aut vix arcuatus, posticus longior, minus obliquus, leviter excurvatus. Umbones parvi, antemediani, paulo prominentes. Linea cardinis mediocriter valida, dentibus anterioribus octo posticisque ad decem munita. Pagina interna nitida, cicatrice antica rotundata et postica majori longiori, impressa. Pallii impressio simplex, haud sinuata.

Length $2\frac{1}{4}$ mm., height $1\frac{2}{3}$, diameter 1.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

This species is quite distinct in form from any of the other species, being decidedly less equilateral. Its teeth also are rather stronger, the ligament less oblique, and the muscular impressions more distinct. Whether this and the other forms exceed their known dimensions, it is impossible to say, but in all probability they do to some extent.

Glomus sp.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

As only a single minute valve of this species was obtained, which is evidently distinct from any of those here described, I refrain from naming it at present. It is

narrower and longer than any of the other forms, oval, a little narrower posteriorly than in front, and somewhat inequilateral, the hinder side being the longer. It is glossy, sculptured with fine lines of growth, and furnished with about fifteen hinge-teeth altogether (six anterior and nine posterior), which are peculiar in having their inner side rise direct from the inner margin of the hinge-plate, and in being less obliquely placed than usual, and rather far apart.

Pectunculus, Lamarck.

Pectunculus pectinatus (Gmelin).

Arca pectinata, Gmelin, Syst. Nat., p. 3313.
Pectunculus pectinatus, Lamarck, Anim. sans vert., ed. 2, vol. vi. p. 494.
Pectunculus pectinatus, Reeve, Conch. Icon., vol. i. pl. vi. fig. 28.

Habitat.—Station 113, off Fernando Noronha, in 1010 fathoms; hard ground.

The few specimens I have seen of this species all agree in having a small brown blotch on the dorsal margin on each side of the umbones, and a much more conspicuous oblique ray on each side but more remote. This feature is best seen when the umbones are towards the eye.

Pectunculus stellatus (Bruguière).

Arca stellata, Bruguière, Ency. Méth., p. 117.
Pectunculus stellatus, Lamarck, Anim. sans vert., ed. 2, vol. vi. p. 491.
Pectunculus stellatus, Reeve, Conch. Icon., vol. i. pl. ii. fig. 5.

Habitat.—Tenerife, in 70 fathoms (Challenger).

The Tenerife shells are mostly of a purple-reddish tint, zoned at intervals with a darker colour, and invariably have the white star-shaped patch at the umbones. They are also rayed with slender white lines, and some of the specimens are ornamented with wavy concentric reddish lines. The interior of the largest shells is generally totally white, but some of the smaller specimens have the central portion of the valves stained and blotted with deep purple-brown.

The epidermis of this species is very deciduous, only the smallest portion at the circumference of the valves apparently ever remaining. It is not of the hairy character of *Pectunculus pilosus*, *Pectunculus siculus*, and some others, but has a more chaffy appearance. The surface of the valves, besides the concentric lines of growth, has scarcely any sculpture, the fine radiating striæ met with in *Pectunculus siculus* and some others being entirely absent.

Pectunculus formosus, Reeve.

Pectunculus formosus, Reeve, Conch. Icon., vol. i. pl. viii. fig. 48*b*.

Habitat.—St. Vincent, Cape Verde Islands, in 7 to 20 fathoms.

The figure 48*a* of Reeve seems to represent a distinct species. The shells from the above locality, which I have identified as *Pectunculus formosus*, are very little more than an inch in length. They are of a whitish ground colour, and variegated with a considerable amount of interrupted purplish-red rays as depicted by Reeve. The sculpture consists of concentric lines of growth, which at the sides become a little raised. A thinnish epidermis covers portions of the surface, more especially near the outer margin. It is finely concentrically lamellated and radiately ciliated, and when removed the surface exhibits more or less clearly punctured lines which indicate the position of the cilia. The umbones appear to be invariably white, and the hinge-plate is blotched within on each side with purple-brown or red. The teeth are arranged in an uninterrupted arcuate series, and are about twenty to twenty-four in number. The interior of the valves is for the most part white, and the outer margin is finely denticulate.

This species is very closely allied to *Pectunculus stellatus*, and, indeed, may eventually prove to be a variety of it, differing somewhat in the style of its colouring and the epidermis.

Pectunculus holosericus, Reeve.

Pectunculus holosericus, Reeve, Conch. Icon., vol. i. pl. iv. fig. 18.
Pectunculus holosericus, Reeve, Proc. Zool. Soc. Lond., 1843, p. 31.
Axinia holosericus, Angas, Proc. Zool. Soc. Lond., 1867, p. 932.

Habitat.—Port Jackson, in 2 to 10 fathoms (Challenger): Broken Bay, New South Wales (Brit. Mus.); Watson's Bay (Angas).

On the soft velvety epidermis being removed, the entire surface of this species is minutely reticulated with radiating and concentric striæ. The colour is usually light brownish-white, generally variegated at the beaks with a few pale brownish-red zig-zag markings. The interior is at times totally white, but frequently more or less stained towards the pallial line on one side with a rich purple-brown tint.

? *Pectunculus striatularis*, n. sp., (Lamarck ?) Reeve.

Pectunculus striatularis, (Lamarck) Reeve, Conch. Icon., vol. i. pl. vi. fig. 27

Habitat.—Port Jackson, New South Wales, in 6 to 7 fathoms; and Station 212, south of the Philippine Islands, in 10 fathoms.

The identification of this species either from the description given by Lamarck or that in Reeve's work would be quite impossible; but, having the specimen delineated in the Conchologia Iconica for comparison, I am able to state that the few valves from the above localities probably belong to it. They are, however, paler in colour, lack the brown stain on the anterior side within the valves, and the denticles within the outer margin are rather more grooved. Reeve's shell is said to have come from the west coast at Swan River.

Pectunculus beddomei, n. sp. (Pl. XVIII. figs. 1–1*b*).

Testa subcompressa, rotundata, crassa, antice peculiariter radiatim constricta, alba vel dilute fuscescens, hic illic fusco maculata, radiatim costata, costis circa 24 parum elevatis, rotundatis, quam sulcis intermedianis valde latioribus, incrementi lineis confertissimis elevatis, undulatis insculpta. Pagina interna alba, utrinque supra cicatrices fusco radiata, sæpe marginem versus fusco tincta. Margo internus plerumque alba, dentibus circiter 17 latis concavis munitus.

This species is about as long as high, rather flat, roundish, and solid. It is of a white or light brown colour, spotted and stained with dark rich brown upon the radiating ribs. These are very broad, flattened, rounded at the top, and much wider than the grooves separating them, indeed, they almost join one another at their bases. They are about twenty-four in number, those on each side being considerably more slender than those down the middle. The remaining sculpture consists of closely packed wavy conspicuous sublamellated lines of growth which pass over and between the costæ. At the anterior end there is a faint depression which radiates down the valves, marking off, as it were, a large prominent lunule. The ligamental area is deep and narrow, slightly separating the acute beaks. The hinge-plate is moderately broad, white, and furnished with seven to ten oblique denticles, forming a slightly curved series on each side. The interior is white at the middle and towards the umbones, but generally more or less stained with brown, nearer but not upon the margin. The muscular scars always have a broad dark brown ray upon them, and are bordered within by a raised edge. The margin of the valves is white, shallowly scalloped at the edge, and armed within with about seventeen broad flattened concave denticles.

Length 42 mm., height 44, diameter 22.

Length 42 mm., height 41, diameter 21.

Habitat.—Station 162, off East Moncœur Island, Bass Strait, in 38 fathoms; sand and shells.

This species is remarkable on account of its broad and not much raised ribs, and the dark brown rays on the muscular impressions. The depression down the anterior side is not very conspicuous, but apparently present in all specimens.

This species must not be confounded with *Pectunculus laticostatus*, Quoy and Gaimard, a form common in some parts of New Zealand. That species is broader at the upper part, and has many more and finer ribs, lacks the depression down the front of the valves, has fewer hinge-teeth, more marginal denticles, and no brown mark on the hinder muscular scar, besides other minor differences.

It is possible this may be the *Pectunculus flabellatus* of Tenison-Woods (Trans. Roy. Soc. Victoria, 1878, vol. xiv. p. 61), but I cannot quite reconcile it with the description. I do not find the number of ribs ever amounting to thirty-five, nor do they "become very close at the sides as the shell grows." If by "alt." Mr. Tenison-Woods means the diameter of the closed valves, I should think he has given the wrong measurement (44 mm.) under this head, or else his character "*tumidiuscula*" must be incorrect. *Pectunculus beddomei* is only about half that extent in diameter, and decidedly flatter than *Pectunculus laticostatus*.

No mention is made of the peculiar dark brown muscular scars in *Pectunculus flabellatus*, which is a prominent feature in the present species, the interior being described as if entirely of an "intense fulvous brown."

Pectunculus vitreus, Lamarck.

Pectunculus vitreus, Lamarck, Anim. sans vert., ed. 2, vol. vi. p. 495.
Pectunculus vitreus, Reeve, Conch. Icon., vol. i. pl. viii. figs. 15, *a*, *b*.
Pectunculus vitreus, Hanley, Cat. Rec. Biv. Shells, p. 165, pl. xix. fig. 28.

Habitat.—Station 188, south of New Guinea, in 28 fathoms (Challenger); Cape York (Brit. Mus.).

The ribs of this remarkably flattened species are two or three times more numerous towards the outer margin than near the umbones, which results from their being dichotomous when the shell is young, and other intervening ones being produced during growth.

When in fresh condition the radiating slender costæ are finely nodose, and the sulci between them are very distinctly concentrically striated. The interior of the valves is either entirely white or more or less stained with brown, and is also very finely radiately ridged.

The hinge is very peculiar, consisting of two all but straight series of teeth, which converge to an angle of about 105°. The teeth are about fourteen on each side, mostly grooved at the top, and placed almost parallel with the dorsal margin. The sculpture and hinge of *Pectunculus nova-guineensis*, Angas, is precisely of the same character as in this species, and I am of opinion that when our series of specimens is sufficiently large, it will be found to be only a variety, differing from the type merely in outline.

Limopsis, Sassi.

Limopsis marionensis, n. sp. (Pl. XVIII. figs. 2–2*b*).

Testa valde inæquilateralis, crassiuscula, oblique ovata, postice paulo angustata, latere antico late arcuato, postico subacute rotundato. Valvæ probabiliter albidæ, epidermideque hirsuta amictæ, striis tenuibus numerosis radiantibus aliisque concentricis decussatæ. Area ligamenti profunda, excavata. Dentes cardinis numerosi, circiter 20–24.

This is a larger and more solid species than *Limopsis straminea*, and differs from it also both in form and sculpture. It is not dilated posteriorly like that form, but on the contrary is even faintly pointed or at all events more sharply rounded. The sculpture is much stronger, and the hinge-teeth are more numerous.

Length 28 mm., height 22, diameter 12.

Habitat.—Station 145, Marion Island, in 140 fathoms, and Prince Edward Island, in 100 to 150 fathoms.

All the specimens of this species which were obtained are old dead valves, and in poor condition, but retain sufficient of their characters for description.

Limopsis pelagica, n. sp. (Pl. XVIII. figs. 3–3*a*).

Testa forma habituque *Limopsis marionensis* sed sculptura dissimilis. Valvæ antice et in medio striis punctatis tenuibus radiantibus, postice liris tenuissimis elevatis incrementi lineis decussatis ornatæ. Epidermis pallide olivacea, tenuiter fibrosa.

This species closely resembles *Limopsis marionensis* in form, the character of the hinge, the ligamental area, and the interior of the valves, and is mainly distinguished by a difference of sculpture. This consists of numerous shallowly pitted radiating lines which develop behind into slender liræ, decussated by the concentric lines of growth which are more elevated here and in front than upon the central portion of the valves. The epidermis consists of very fine short pale olive fibres, which are very closely set around the outer margin, forming a dense, soft fringe.

Length 22 mm., height 20, diameter $9\frac{1}{2}$.

Habitat.—Station 106, Mid Atlantic, depth 1850 fathoms; also Station 232, off Inosima, Japan, at a depth of 345 fathoms.

A single shell from the latter locality, dredged without the animal, I can in no way distinguish from those obtained at a depth of 1850 fathoms in Mid Atlantic. This is another instance, of which several have already been recorded, of shells found in Japanese waters being identical with those inhabiting the Mediterranean and Atlantic Oceans.

This species is very like *Limopsis aurita*, and may be only a large thin form of it.

Limopsis straminea, n. sp. (Pl. XVIII. figs. 5–5*a*).

Testa peroblique ovata, inæquilateralis, subcompressa, alba, nitida, epidermide fibrosa straminea plus minusve induta, incrementi lineis striata, striis radiantibus punctatis sculpta. Margo valvarum undique convexus, acutus. Latus anticum angustum, posticum latum, dilatatum. Dentes cardinis circa duodecim, inæquales. Pagina interna lactea, prope lineam pallii radiatim substriata. Area ligamenti parva.

This is an oblique species, irregularly ovate, broader behind than in front, having all the margins more or less convex. The hinge-line, however, is almost rectilinear, and the front portion of the ventral outline, which ascends obliquely, is rather straight. The valves are very inequilateral, thinnish, pure white, and clothed to a great extent with a straw-coloured fibrous epidermis. The umbones are elevated a little above the hinge-line, are devoid of epidermis, and are slightly separated. The sculpture consists of fine radiating striæ, which are in a great measure interrupted by the concentric lines of growth, and have on this account a somewhat punctate appearance. The interior is milk-white, dull at the centre of the valves and glossy towards the margin, and exhibits numerous substriæ directed from the palliai line towards the umbones. The hinge-plate is thinnish, and armed with about a dozen unequal denticles.

Length 20 mm., height 15½, diameter 8.

Habitat.—Station 150, between Kerguelen and Heard Islands, at a depth of 150 fathoms; coarse gravel.

Limopsis torresi, n. sp. (Pl. XVIII. figs. 4–4*a*).

Testa parva, convexa, leviter obliqua, altior quam longa, alba, costis concentricis crassiusculis, lirisque tenuibus radiantibus cancellata. Margo dorsi rectus, brevis; umbones parvi, supra marginem parum producti; linea cardinis mediocriter angusta dentibus circiter octonis in medio interruptis instructa; pagina interna submitida, obsolete radiatim striata, margine externo intus denticulato.

This is a small, rather convex shell, higher than long, obliquely roundish, white and finely cancellated by fine concentric ribs, and as a rule rather finer radiating liræ, the points of contact becoming a trifle thickened or subnodose. The beaks are small, not quite contiguous, and just a little elevated above the dorsal line, which is short and straight. The hinge-plate is not particularly broad, and is furnished with about eight denticles, there being four on each side of a small central smooth space. The interior is not very glossy, exhibits more or fewer radiating striæ, and has the outer margin, especially the lower part, denticulate within.

Length 3⅓ mm., height 3½, diameter 2¼.

Habitat.—Station 185B, Raine Island, Torres Straits, in 155 fathoms; coral sand.

Limopsis cancellata (Reeve).

Pectunculus cancellatus, Reeve, Conch. Icon., vol. i. fig. 39.
Limopsis woodwardi, A. Adams, Proc. Zool. Soc. Lond., 1862, p. 231.
Limopsis philippii, A. Adams, *op. cit.*, p. 230.

Habitat.—Flinders Passage, Station 186, Wednesday Island, Cape York; and Station 188, in 28 fathoms (Challenger); Singapore (Reeve); Lizard Island, Torres Strait (Adams).

After a careful study of the above so-called species I cannot find any good reasons for their separation. The small difference in form is of little importance, as all the species of this genus appear to be more or less variable in this respect. The sculpture of all three is essentially the same, and the hinge-teeth, about twenty-two in number, and the ligamental pit are quite similar in all. The inner edge of the valves is smooth and flattened, the extreme outer edge being minutely crenulated by the external ridges. The epidermis is finely pilose, and in concentric fringes.

Limopsis bassi, n. sp. (Pl. XVIII. figs. 6–6*a*).

Testa *Limopsidi cancellatæ* similis, sed major, magis obliqua et transversa, dentibus minus numerosis munita, intus et extra plus minusve fusco tincta.

This species has a clathrate exterior like that of *Limopsis cancellata* of Reeve, but may be distinguished by its more transverse and oblique growth, which appears to be constant in the good series of specimens at hand. It is also a larger shell, and, when the thick pilose epidermis is removed, is seen to be stained with a reddish-brown tint, except towards the umbones. The hinge-teeth are only about fifteen or sixteen in number, or six or seven fewer than in *Limopsis cancellata*, and that too, a smaller form. The striated interior and the smooth flattened outer margin are alike in both species, except that the latter in *Limopsis bassi* is usually tinted with reddish-brown.

Length 22 mm., height 18, diameter 9.

Habitat.—Station 162, off East Moncœur Island, Bass Strait, in 38 fathoms; sand and shells.

To show the variation in form, I give the following dimensions of another unusually long specimen:—length 20 mm., height 15½, diameter 8½.

Limopsis brazieri, Angas.

Limopsis brazieri, Angas, Proc. Zool. Soc. Lond., 1871, pp. 21, 101.

Habitat.—Port Jackson, in 2 to 10 fathoms.

I have not much to add to Mr. Angas' description of this little species, but may observe that the fine concentric ridges are seen under a strong lens to be somewhat

crenulated, and that the margin of the valves is smooth and flattened within. The shell is a little inequivalve, the anterior end or that towards which the beaks incline being shorter than the posterior. The hinge-teeth are few in number, about three or four on each side the central triangular deepish ligamental pit.

Limopsis aurita (Brocchi).

Area aurita, Brocchi, Conch. Foss. sub-app., vol. ii. p. 485, pl. xi. fig. 9.
Pectunculus auritus, Philippi, Enum. Moll. Sicil., vol. i. p. 63, vol. ii. p. 45.
Limopsis aurita, Jeffreys, Brit. Conch., vol. ii. p. 161, pl. iv. fig. 3, vol. v. p. 174, pl. xxx. fig. 1.
Limopsis aurita, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 585.

Habitat.—Station 73, west of the Azores, in 1000 fathoms; Station 56, off Bermudas, in 1075 fathoms; Station 23, off Sombrero Island, West Indies, in 450 fathoms.

Limopsis cumingii, A. Adams, associated by Jeffreys with this species, besides being very different in form, has the teeth in a greater curve, and a peculiar lunular excavation on the longer dorsal slope just in front of the anterior teeth. *Limopsis minuta* and the present species appear to be very much alike, the former being smaller, with the inner margin of the valves crenulated, but whether this be a good specific character in this genus appears to me at present rather doubtful.

Limopsis lata, n. sp. (Pl. XVIII. figs. 7–7*a*).

Testa paulo obliqua, late subovata, griseo-albida, epidermide fibrosa, præcipue prope marginem amicta, liris concentricis et radiantibus tenuibus cancellata. Margo dorsi mediocriter elongatus, rectus. Latus anticum oblique curvatum, posticum minus arcuatum, vix truncatum. Area ligamenti fuscescens, anguste elliptica, concava, in medio ligamento parvo angulato saturate brunneo instructa. Dentes cardinis circiter 8–9 validi. Pagina interna rugosa, subpunctata, margine crenulato, subdentato, incrassato.

This, judging from the series of specimens at hand, is a small species. It is moderately thick and ventricose, somewhat oblique, of a dirty whitish colour, and more or less covered with an epidermis which towards and upon the outer margin is rather coarsely fibrous. The sculpture consists of fine radiating and concentric lirae, producing a cancellated surface. The hinge-margin of course is straight and rather long. The anterior side is broadly curved and very oblique below the middle, the posterior being less regularly arcuate and in some examples somewhat truncated. The umbones are

acute when not eroded at the tips as is frequently the case, and located a trifle in advance of the middle. The dorsal area is narrow, elongate-elliptical, rather deeply concave, of a light brown colour, and provided with a diamond-shaped central dark brown ligament. The hinge-teeth are strongish, in an almost straight series, and number about eight or nine, of which two or three more are on the anterior side of the beaks than behind. The interior of the valves is dull whitish, rather roughish, exhibiting a kind of shallow pitting or subpunctation. The outer margin is thickened, distinctly dentate inferiorly, and crenulated at the sides.

Length $8\frac{1}{2}$ mm., height $8\frac{1}{2}$, diameter $4\frac{2}{3}$.

Habitat.—Station 169, off the north-east coast of New Zealand, at a depth of 700 fathoms.

This little species is peculiar for its width, comparative solidity, and dentate margin, and bears considerable resemblance to *Limopsis minuta*.

Limopsis minuta (Philippi).

Pectunculus minuta, Philippi, Enum. Moll. Sicil., vol. i. p. 63, pl. v. figs. 3*a*, 3*b*, vol. ii. p. 45.
Limopsis minuta, Sars, Moll. Reg. Arct. Norv., p. 44, pl. iii. figs. 5, *a–c*.
Limopsis minuta, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 585, pl. xlvi. fig. 9.

Habitat.—Station II., off east coast of Portugal, in 470 fathoms; Station 75, Fayal, in 450 fathoms; Tenerife, in 70 fathoms; Station VIII., Canary Islands, in 620 fathoms; and Station 24, off Culebra Island, West Indies, in 390 fathoms.

For the synonymy and distribution of this species consult the above paper by Dr. Gwyn Jeffreys. I agree with him in considering *Limopsis abyssicola*, A. Adams, the same as this species, but do not think that *Limopsis cumingii* of that author is conspecific with *Limopsis aurita*, Brocchi.

Subfamily Arcin.e.

Arca, Linné.

Arca noæ, Linné.

Arca noæ, Linné, Syst. Nat., ed. 12, p. 1140.
Arca noæ, Reeve, Conch. Icon., vol. ii. pl. xi. fig. 72.

Habitat.— Station 36, off Bermuda, in 32 fathoms.

This well-known Mediterranean and West Indian species in the very young state has at times the posterior side deeply notched.

Arca navicularis, Bruguière.

Arca navicularis, Bruguière, Ency. Méth., Vers., vol. i. p. 99, No. 4.
Arca navicularis, Philippi, Abbild., vol. ii. p. 210, pl. iii. fig. 2.
Arca navicularis, Reeve, Conch. Icon., vol. ii. pl. xi. fig. 70.
Arca navicularis, Wood, Ind. Test., pl. ix. fig. 5.
Var. = *Arca lintor*, Jonas, Philippi, *op. cit.*, p. 209, fig. 1.
Var. = *Arca subquadrangula*, Dunker, Philippi, *op. cit.*, p. 210, fig. 3.
Var. = *Arca cumingii*, Dunker (MS. in Coll. Cuming), H. and A. Adams, Gen. Rec. Moll., vol. ii. p. 533.

Habitat.—Cape York, North Australia, in 3 to 12 fathoms.

This species is also known as an inhabitant of the coast of Queensland, and has been recorded from China and Amboina.

It is subject to much variation in form and in the amount of ligament in the dorsal area.

Arca imbricata, Bruguière.

Arca imbricata, Bruguière, Ency. Méth., Vers., vol. i. p. 98, No. 3.
Arca imbricata, Reeve, Conch. Icon., vol. ii. pl. xi. fig. 73.
Arca umbonata, Lamarck, Anim. sans. vert., ed. 2, vol. vi. p. 462, No. 5.
Arca umbonata, Philippi, Abbild., vol. iii. p. 28, pl. iv. fig. 3.
Arca cuneata, Reeve, Conch. Icon., vol. ii. pl. xiii. fig. 87 (altered to *Arca cunealis* in the Index).
Arca kraussi, Philippi, *op. cit.*, p. 88, pl. v. figs. 8–10.

Habitat.—Station 187, near Cape York, North Australia; and Station 113A, off Fernando Noronha, in 25 fathoms.

There should be, one would think, and perhaps in reality there is, a difference between the West Indian and Australian shells which appear to belong to this species, but at present I am unable to discover it.

Arca tetragona, Poli.

Arca tetragona, Poli, Test. Sicil., vol. ii. p. 137, pl. xxv. figs. 12, 13.
Arca tetragona, Forbes and Hanley, Brit. Moll., vol. ii. p. 234, pl. xlv. figs. 9, 10, and Pl. P. fig. 1.
Arca tetragona, Jeffreys, Brit. Conch., vol. ii. p. 180, and vol. v. pl. xxx. figs. 6–6*a*.

Habitat.—Station 75′, off the Azores, in 450 fathoms.

This well-known species has previously been recorded from the Azores and other parts of the Atlantic.

Arca (*Barbatia*) *fusca*, Bruguière.

Arca fusca, Bruguière, Ency. Méth., Vers., vol. i. p. 102.
Arca fusca, Reeve, Conch. Icon., vol. ii. pl. xii. fig. 82.

Habitat.—Kandavu, Fiji Islands.

This species has been already recorded from the Mauritius, the Seychelles, and a few other localities in the Indian Ocean, and is also found on the northern and western shores of Australia.

Arca (*Barbatia*) *fasciata*, Reeve.

Arca fasciata, Reeve, Conch. Icon., vol. ii. pl. xv. fig. 99.
Barbatia fasciata, Angas, Proc. Zool. Soc. Lond., 1867, p. 931.

Habitat.—Port Jackson, New South Wales, in 2 to 10 fathoms.

The ligamental area is very deeply channelled in this species, which at times attains a length of 2 inches.

Arca (*Barbatia*) *lima*, Reeve.

Arca lima, Reeve, Conch. Icon., vol. ii. pl. xv. fig. 101.

Habitat.—Station 208, off the Island of Luzon, Philippines, in 18 fathoms; and Station 186, off Cape York, North Australia, in 8 fathoms (Challenger); Islands of Burias and Corrigidor, Philippines, under stones at low water (Cuming).

This species is more inequilateral than *Arca fasciata* from the New South Wales coast, and is not "light brown, stained with brown, and spotted with brown" as stated by Reeve, but is totally white both within and without beneath the epidermis; that species, on the contrary, being, for the most part, with the exception of a very broad triangular space down the central portion of the valves, stained with a rich brown tint, which is most conspicuous within the valves. The three small specimens from the above locality show that this species (like several others), in the earlier stages, has the posterior side more concave than when adult.

Arca (*Barbatia*) *radula*, A. Adams (Pl. XVII. figs. 3–3*b*).

Arca radula, A. Adams, MS. in Coll. Cuming.

Testa transversa, convexa, inæquilateralis, antice rotundata, postice oblique curvatim truncata, albida, plus minusve fusco tincta, liris radiantibus tenuibus confertis, minute

granulatis, undique instructa, striisque incrementi æqualiter confertis sculpta, epidermide fibrosa marginem versus induta. Area dorsalis angusta, haud profunda. Ligamentum lanceolatum, plerumque haud ante umbones productum. Pagina interna albida, fusco tincta, vel purpureo-fusca. Umbones paulo prominentes, incurvati, circiter in $\frac{1}{3}$–$\frac{1}{4}$ longitudinis collocati.

Like many species of this genus, this is rather irregular in form, some specimens being longer in proportion than others, and rather different in outline. They are for the most part fairly convex, very inequilateral, rounded at the anterior end, and obliquely, but curvedly, truncate behind. The ventral margin is somewhat parallel with the hinge-line, at times exhibiting a slight median sinuation. The valves are not very solid, sculptured with very numerous radiating and concentric striæ, with very slender granular ridges or lirae between them, and clothed towards the outer margin with a brown fibrous epidermis. The colour is variable, some specimens being whitish and faintly tinted with pale brown, whilst others are more uniformly brown. The umbones are moderately prominent, about one and a half millimetres apart, and some distance in advance of the centre. The ligamental area is narrow, and only a little sunken, the ligament usually extending from the posterior end to a little behind the beaks, where it is truncated. The interior varies in colour from whitish, more or less stained with brown, to a uniform purple-brown. The hinge-teeth are small and numerous.

Length 31 mm., height 18, diameter 16.

Habitat.—Station 162, off East Moncœur Island, Bass Strait, in 38 fathoms (Challenger); Hudson's Bay, Port Philip, South Australia, attached to sea-weed, in 4½ fathoms (Brit. Mus.).

The Challenger specimens and those in the British Museum from the latter locality are precisely similar in every respect, but differ slightly in one or two points from those in the Cumingian collection, also said to have come from Port Philip. These are much darker coloured within, which probably in this instance is not a very important distinction, as they appear to be slightly diseased, and the ligament extends somewhat in front of the umbones, whilst in the Challenger shells and the others from Port Philip it is suddenly truncated a little behind them. This, I think, is probably due to age, for the two types in Cuming's collection appear to be older shells than the others under examination, and the largest of the latter shows a slight tendency to prolong the ligament more forward than it is in younger specimens.

Notwithstanding these differences, I believe that they all belong to one and the same species. *Arca parva*, Sowerby, from Ducie's Island, is an allied form, differing in being a little narrower, more finely sculptured, and in having the umbones rather more remote from the centre.

Arca (*Barbatia*) *sculptilis*, Reeve.

Arca sculptilis, Reeve, Conch. Icon., vol. ii. pl. xvii. fig. 118.

Habitat.—Amboina, in 15 to 25 fathoms (Challenger); Island of Bohol, Philippines (Reeve).

This species is only a little inequilateral and somewhat stouter at the anterior end than behind. The ventral margin is very faintly sinuated near, but just a trifle posterior to, the middle, and the posterior end is obliquely truncate, the front margin being arcuate. The ligamental area is a little excavated, exhibiting a small diamond-shaped ligament between the over-curving beaks. The surface of the valves is finely clathrated, the points of intersection of the radiating and concentric lirae being finely nodose. The radiating ridges display a tendency to be alternately fine and coarser, especially towards both ends of the shell, which in a fresh condition may be described as whitish beneath a thin dirty brownish epidermis.

Arca (*Barbatia*) *pterocessa*, n. sp. (Pl. XVII. figs. 4–4*b*).

Testa parva, tennis, valde inæquilateralis, transversa, subcompressa, antice angustata, acuminata, postice dilatata, oblique truncata, sordide albida, epidermide fibrosa laciniata pallide fusca amicta. Valvæ æquales, in medio impressione haud profunda ab umbonibus radianti constrictæ, liris radiantibus tenuibus aliisque concentricis flexuosis concinne cancellatæ. Umbones parvi, acuti, haud approximati, circiter in $\frac{1}{3}$ longitudinis positi. Area ligamenti angusta elongata adamantiformis, postice angustata. Margo ventris obliquus, antice ascendens, prope medium leviter sinuatus. Pagina interna alba. Linea cardinis gracilis, dentibus circa octodecim munita.

This is a small thin species, very inequilateral, narrowed and pointed in front, much dilated and obliquely truncated behind at the upper part, and rounded below the truncation. It is dirty whitish, and covered, except at the apices, with a fibrous pale brown epidermis disposed in concentric and overlapping fringes, and produced beyond the edge of the valves. These are rather compressed, and marked with a slight depression which radiates from the umbones to the ventral margin, a little in advance of the middle. The rectilinear dorsal line does not occupy the entire length of the shell. The anterior side is very short, almost at once curving into the obliquely upward-directed ventral margin, which is slightly sinuated at the termination of the oblique depression down the valves. The sculpture consists of fine radiating lirae, which are interrupted by numerous, flexuose, concentric ridges or lines of growth, together imparting a somewhat cancellated appearance to the surface. The beaks are only a

little raised above the dorsal margin, rather acute, and about a millimetre apart. The ligamental area is elongate diamond-shaped, much narrowed and produced posteriorly, and exhibits traces of a black ligament in the form of two slender lines, converging to a point from the umbones towards the hinder extremity. The hinge-plate is very slender, and armed with about eighteen teeth, whereof eight are in front of the apices, the remainder behind them being oblique, and separated from the others by a short non-dentate portion of the hinge-margin. The interior of the valves is white and only the least glossy.

Length 11 mm., height 6½, diameter 4.

Habitat.—Station 246, Mid North Pacific Ocean, at a depth of 2050 fathoms; bottom, grey ooze. Also Stations 71 and 73, west of the Azores, in 1675 and 1000 fathoms respectively; and finally, Station 24, off Culebra Island, West Indies, in 390 fathoms.

I have already recorded an instance of a species from very deep water in the Atlantic, which is all but identical with another from a still greater depth in the Pacific (*vide Callocardia atlantica* and *Callocardia pacifica*), but here in this instance I am unable to distinguish the examples from these two oceans. Such a distribution is an eminently perplexing fact, a problem difficult of true explanation.

Area (*Barbatia*) *corpulenta*, n. sp. (Pl. XVII. figs. 5–5*b*).

Testa tenuis, globosa, inæquilateralis, obliqua, altior quam longa, albida, epidermide tenui olivaceo-fuscescenti, subfibrata induta, lineis, elevatis radiantibus filiformibus aliisque concentricis minute cancellata. Umbones magni, inflati, involuti, haud approximati, latus anticum versus inclinati. Area dorsalis angusta, longitudinem testæ fere æquans. Ligamentum lineare, nigrum, post umbones positum. Latus anticum late, aliquantoque irregulariter arcuatum, posticum subrectum. Margo ventris semicircularis, antice oblique adscendens. Pagina interna alba, confertim et radiatim subpunctata. Linea cardinis angusta, dentibus irregularibus (in medio subobsoletis) utrinque armata.

This remarkable species is very thin, much inflated, oblique, truncate-ovate, inequilateral, white, and covered with a thin olive-brownish more or less hairy epidermis. The sculpture consists of very numerous, excessively fine concentric hair-like liræ which are crossed by others as close and fine or even more slender which radiate from the umbones, together forming a minute cancellation, the points of contact being raised into minute tubercles from which arise the epidermal hairs. One of these radiating lines, on the right valve only (the corresponding place in the left being marked by a faint depression), is twice as thick as the others and located on the

posterior side, marking off as it were a dorsal area. The umbones are very prominent, much inflated, well curved over towards the front, and a little remote from one another. The anterior outline is oblique, broadly and somewhat irregularly arcuate, there being a slight bulge near the upper extremity. The posterior side is straighter, very faintly sinuated by the radiating depression, and regularly rounding beneath into the ventral margin, which is obliquely subsemicircular. The dorsal area is narrow, broadest in front of the beaks, gradually attenuating posteriorly. It has the central line elevated anteriorly, and sunken at the opposite end beneath the ligament. This is small and of course narrow, bounded on each side by the acute raised edges of the area, of a black colour, and located in a few parallel grooves forming a much elongated diamond-shaped figure. The hinge-line is slender, almost equalling the shell in length, and armed with a few rather irregular teeth, at times more or less obsolete near the centre. The interior of the valves is white, and on account of the thinness of the shell partly exhibits the character of the external sculpture, and is more or less radiately faintly punctate, the rows of minute feeble pittings corresponding with the liræ of the exterior.

Length 20 mm., height 25, diameter 19½.

Habitat.—Station 184, east of Cape York, North Australia, at a depth of 1400 fathoms; Station 194, south of Amboina, in 200 fathoms; Station 198, off the north-eastern extremity of Celebes, at a depth of 2150 fathoms; Station 216A, north-west of New Guinea, in 2000 fathoms; Station 271, Mid Pacific, depth 2425 fathoms; and finally, Station 300, near the Island of Juan Fernandez, off the Chilian coast, in 1375 fathoms.

This species is very unlike the typical forms of *Barbatia*, being far more globular, of very thin substance, more finely sculptured, and clothed with a thinner epidermis. There are, however, intermediate species which it more nearly resembles in some of the above mentioned particulars, so that I think it may (at all events for the present) be considered a very aberrant form of that group.

Area (*Acar*) *congenita*, n. sp. (Pl. XVII. figs. 6–6*a*).

Testa oblonga, crassiuscula, inæquilateralis, antice angusta, oblique curvata, postice latior, oblique truncata, superne inferneque angulata, albido-fuscescens, lamellis concentricis, crassis, liris radiantibus minus conspicuis crenulatis, sculpta. Valvæ pone angulum cristatum ab umbone ad extremitatem posticam decurrentem concavæ, in medio leviter depressæ. Umbones parvi, parum remoti, circa in $\frac{2}{7}$ longitudinis collocati. Area ligamenti angusta; dentes ad sedecim utrinque obliqui. Pagina interna alba, submitida.

This is a fairly solid little species, whitish brown, very inequilateral, of an oblong form, narrow in front and gradually widening towards the posterior end, which is

obliquely truncate. The dorsal line is not quite so long as the entire shell, owing to the obliquity of the hinder side. The valves exhibit a very faint depression down the middle, which causes the ventral margin to have a slightly incurved appearance at that point, and at the posterior end, behind a prominent crested ridge or angle radiating from the umbones to the lower hindmost extremity, they are conspicuously concave. The sculpture consists of strong imbricating lamellæ and radiating ridges. The former are most conspicuous, frilled on crossing the ribs, and produced into short, hollow spines on the posterior angle. The radiating ridges are about twenty-five to thirty in number, most crowded a little in front of the centre, coarsest and farthest apart just in advance of and upon the oblique keel, from which those on the hinder concave surface radiate, and not from the umbones like the rest. The ligamental area is narrow, broadest towards the front, and gradually tapering backwards, but not extending to the end of the dorsal line. The umbones are small, hardly half a millimetre apart, curved over at the tips, and situated at about two-sevenths of the entire length of the shell, from the anterior extremity. The inner surface of the valves is white, a little glossy, showing indications of grooving, corresponding to the external sculpture, and on each side under the hinge-plate the muscular scars, of which the posterior is the larger, are conspicuously white and thickened. The hinge-plate is not very broad, and bears about sixteen teeth, which are placed obliquely towards both ends; and, under the microscope, appear roughly striated.

Length 10 mm., height 5, diameter 5.

Habitat.—Station 201, off the west coast of Mindanao, Philippine Islands, in 82 fathoms; stones and gravel.

This species is closely related to *Arca domingensis*, but may be at once distinguished by its broad truncate posterior end.

Arca (*Acar*) *domingensis*, Lamarck.

Arca domingensis, Lamarck, Anim. sans vert., ed. 2, vol. vi. p. 167.
Arca domingensis, Lischke, Jap. Meeres-Conch., part ii. p. 112.

Habitat.—Station 36, off Bermuda and St. Vincent, Cape Verde Islands, in 30 fathoms; coral.

For the remarkable distribution of this species, and some interesting observations on the synonymy, consult the above work by Lischke.

Arca (*Scapharca*) *angicostata*, Reeve.

Arca angicostata, Reeve, Conch. Icon., vol. ii. pl. ix. fig. 57.

Habitat.—Station 212, south of the Island of Mindanao, Philippines, in 10 fathoms; sand.

The locality of this species has not been hitherto recorded. The most slender ribs are a few just in front of the centre of the valves, those on the anterior end being rather stouter but not so thick as those down the posterior angle. Between the ribs are fine concentric liræ which connect them and produce a slightly nodulose appearance and somewhat crenulated edges. The interior of the valves is white, with the exception of a small portion in the umbonal region, which is yellowish.

Arca (*Scapharca*) *clathrata*, Reeve.

Arca clathrata, Reeve, Conch. Icon., vol. ii. pl. vii. fig. 48.

Habitat.—Torres Strait, in 3 to 11 fathoms; and Amboina, in 15 to 25 fathoms (Challenger); Islands of Burias and Ticao, Philippines (Reeve).

The ribs in this species are about twenty-five in number, rather sharply cut at the sides, and separated by deepish grooves. It is very closely related to *Arca radiata*, Reeve. The three small valves from Torres Strait are more like the types as regards form than the single specimen from Amboina, which is narrower behind and more arcuate below.

Arca (*Scapharca?*) *consociata*, n. sp. (Pl. XVII. figs. 7–7*a*).

Testa *Arcæ clathratæ* similis, sed costis tuberculis minoribus et rotundatioribus ornatis, lineis incrementi in interstitiis magis remotis et curvatis, umbonibus in medio haud impresse radiatis.

This species is very like *Arca clathrata*, Reeve, in general aspect, but is, I believe, distinct. The valves have no impressed ray near the beaks, the raised lines of growth between the ribs are more curved and somewhat further apart than in Reeve's shell, and the nodules are smaller, not so broad as the costæ, and more raised like minute half-beads. At each end of the hinge-line, and parallel with it, are two or three short, raised lines at right angles to the teeth, which do not exist in *Arca clathrata*.

Length 12½ mm., height 9½, diameter 8½.

Habitat.—Station 189, Arafura Sea, in 25 fathoms; green mud.

The above dimensions do not probably represent the full size attained by this pretty species.

Arca (*Scapharca*) *gubernaculum*, Reeve.

Arca gubernaculum, Reeve, Conch. Icon., vol. ii. pl. iii. fig. 14.
Arca chalcanthum, Reeve, *loc. cit.*, pl. vii. fig. 43.
Arca luzonica, Reeve, *loc. cit.*, fig. 44.

Habitat.—Port Jackson, in 2 to 10 fathoms.

Arca chalcanthum is certainly a slightly shorter form of this species, with which it exactly corresponds in all other respects. Both are said to have been obtained at the Philippine Islands.

Arca (*Scapharca?*) *inæquisculpta*, n. sp. (Pl. XVII. figs. 8–8*c*).

Testa parva, oblique truncato-ovata, ventricosa, inæquilateralis, alba, epidermide tenui, aliquanto fibrata, induta, concentrice radiatimque tenuiter lirata, cancellata. Latus anticum obliquissime late arcuatum, posticum subperpendiculariter curvatum. Margo ventris subsemicircularis, antice oblique ascendens. Umbones vix prominuli, parvi, paululum remoti, haud acuti. Area dorsalis angusta, paulo impressa, marginibus carinatis præcipue posterioribus circumdata. Dentes haud numerosi, utrinque a medio divergentes. Pagina interna alba, in valva sinistra prope marginem sulco punctato-denticulato ornata.

This species is about as high as long, obliquely ovate, truncate above, rather ventricose, inequilateral, inequivalve, of a pure white colour, in fresh specimens more or less covered with a thin and somewhat hairy epidermis. The valves are rather glossy, thinnish, sculptured with fine concentric grooves and intervening raised liræ, which are excessively fine at the sides and a little thicker at the middle. These are crossed by other rather finer liræ which radiate from the umbones and produce a finely cancellated surface. They are rather more elevated in the right valve than in the left. The dorsal line occupies the whole length of the shell, the angles formed by its conjunction with the sides being rather greater than right angles. The ventral outline is very arcuate, ascending obliquely in front, and more suddenly behind, on which side the margin is very slightly curved and almost perpendicular. The opposite is more arcuate, and curves obliquely towards the base. The umbones are not large, only a trifle raised above the hinge-line, not acute, a little remote from one another, and located at about one-third of the entire length of the shell from the anterior end. The ligamental area is narrow, somewhat broader in front of the beaks than behind them, a little sunken, and bordered with carinate margins, especially posteriorly. The hinge-teeth are not very numerous, being about seventeen to twenty, divergent on each side of the centre. The interior is white, in young specimens at times exhibiting more or less radiate subpunctate grooving. In the left valve, just within the margin, there is a narrow punctate and finely denticulated groove, which receives the margin of the opposite valve.

Length $8\frac{1}{2}$ mm., height 8, diameter $6\frac{1}{2}$.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

It is curious that in this species the radiating excessively fine liræ should be decidedly more distinct and elevated in the right valve than in the left. It is closely related to *Arca pectunculoides* and *Arca fridei*, but was pronounced distinct by the late Dr. Gwyn

Jeffreys, who, with his accustomed courtesy, kindly examined this species, and showed me the specimens of *Arca frielei* figured in the Proc. Zool. Soc. Lond.

Arca (*Scapharca ?*) *culebrensis*, n. sp. (Pl. XVII. figs. 9–9*b*).

Testa transversa, valde inæquilateralis, antice angustata, postice dilatata, utrinque rotundata, alba, tenuissime cancellata, plus minusve granulata. Valvæ tenues, semipellucidæ, impressione haud profunda ab umbonibus ad marginem ventralem paulo ante medium leviter sinuatum signatæ. Umbones parvi, parum prominentes, lævigati, subapproximati, circa in $\frac{1}{5}$ longitudinis positi. Dentes circa 8, utrinque divergentes, in medio interrupti.

This species is very inequilateral, longer than high, much narrower in front than behind, where it may be said to be dilated. Both extremities are rounded, and the ventral margin, which ascends obliquely towards the anterior end, is faintly incurved a little in advance of the middle at the termination of a shallow depression, which extends from the beaks downwards. The valves are thinnish, semitransparent, white, and sculptured with numerous very fine radiating and concentric liræ, the points of intersection being, as frequently is the case, somewhat thickened, and on the posterior side distinctly granulose. The umbones are not much raised above the dorsal line, situated from one-fourth to one-fifth of the total length from the anterior end, and smoothish at the tips, which are only a little apart. The hinge-plate is considerably shorter than the valves, and is furnished with about eight divergent teeth, of which three are in front of a central edentulous space and five behind it, the whole series forming a nearly straight line. Owing to the transparency of the valves, more or less of the external ornamentation is visible within.

Length 5 mm., height $3\frac{1}{2}$, diameter $2\frac{1}{2}$.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

This species is very like the variety *septentrionalis* of *Arca pectunculoides*, Scacchi, but rather more oblique in growth, more sharply rounded behind, with the umbones more anterior, &c.

Arca (*Trisis*) *semitorta*, Lamarck.

Arca semitorta, Lamarck, Anim. sans vert., ed. 2, vol. vi. p. 460.
Arca semitorta, Reeve, Conch. Icon., vol. ii. pl. xiii. fig. 89.

Habitat.—Torres Strait, 3 to 12 fathoms (Challenger); Port Essington (Brit. Mus.); Zebu, Philippines (Cuming); Tasmania (Lamarck).

The last locality has not, I believe, been confirmed.

Arca (*Macrodon*) *dalli*, n. sp. (Pl. XVII. fig. 10–10*b*).

Testa transversa, oblonga, valde inæquilateralis, antice rotundata, postice obliquiter arcuatim truncata, ad extremitatem acute rotundata, sordide albida, epidermide fusco-olivacea concentrice lamellata induta. Valvæ mediocriter tenues, undique tenuiter liratæ, incrementique lineis sculptæ. Pagina interna cæruleo-albida, nitida, tenuiter radiatim striata, margine externo vix crenulato. Area ligamenti angustissima, linearis. Linea cardinalis dentibus paucis (circiter 8–10) inæqualibus anticis, duobus posticis perelongatis, margine dorsali parallelis, instructa.

This species is very inequilateral, oblong, transverse, moderately convex, rounded in front, obliquely curvedly truncate behind, and sharply rounded at the extremity. The valves are not particularly thick, but rather thin, dirty whitish, and covered to a great extent with a brownish-olive epidermis which at short intervals is concentrically lamellated. The sculpture consists of fine close-set radiating liræ and fine lines of growth, some at intervals, which mark the position of the epidermal lamellæ, being especially conspicuous. The umbones are small, close together, not more than a millimetre apart, and situated at scarcely a fourth of the whole length from the anterior end. The ligamental area is very narrow indeed, the ligament being principally behind the beaks in a groove on the hinge-margin. There are eight or ten denticles upon the anterior half of the hinge-plate, of which the front ones are the largest, and at the posterior end are two or three elongated ones parallel with the dorsal outline. The interior is bluish-white, exhibiting concentric zones and radiating fine but distinct striæ, except on the margin outside the pallial line.

Length 31 mm., height 18, diameter 12.

Habitat.—Station 233A, off Kobé, Japan, in 50 fathoms; sand.

The posterior teeth are not so long as in the type of the section *Macrodon*, but still quite different from any other species of recent Arcidæ with which I am acquainted.

It is interesting to find this fossil form occurring in the Pacific Ocean, it having already been recorded from deep water in the West Atlantic by Mr. Dall (Report Moll. "Blake" Exped., 1877–79, p. 120), with whose name I have the pleasure of associating the present species.

Family JULIIDÆ.

Julia, Gould.

Julia exquisita, Gould.

Julia exquisita, Gould, Proc. Boston Soc. Nat. Hist. (1862), vol. viii. p. 284.
Julia exquisita, Gould, Otia Conch., p. 241.
Julia exquisita, O. Semper, Journ. de Conch., 1865, vol. xiii. p. 297.
Prasina borbonica, Deshayes (1863), in Maillard's Ile de la Reunion, vol. ii. Annexe E, p. 29, pl. iv. figs. 1–8.

Testa minuta, oblonga, antice producta, rostrata, ante umbones concave depressa,

valde inæquilateralis, sordide albida, subpellucida, crassiuscula, parum convexa, postice rotundata, striis incrementi minutis sculpta, lineisque albis conspicuioribus numerosis radiantibus curvatis ornata. Margo dorsi anticus brevissimus, leviter concavus, declivis, posticus elongatus, arcuatus, horizontalis. Margo ventris parum convexus, antice lente ascendens. Umbones conspicue antrorsum involuti, haud contigui, in $\frac{1}{4}$ longitudinis collocati. Linea cardinalis pone umbones arcuata, in valva sinistra sulco elongato arata, dente unico crassissimo ab apice fossa profunda separato munita. Pagina interna nitida, striis radiantibus notatis. Cicatrices et linea pallii haud conspicuæ.

Only two left valves of this curious little shell were obtained. They are very inequilateral, the anterior side being very short, acuminated or beaked, the posterior on the contrary terminating in a broadly rounded extremity. They are thickish in substance, subpellucid white, not very convex, rather deeply concave in front of the umbo. They are sculptured with very minute striæ of growth, and one of them is further ornamented with numerous curved radiating lines which appear opaque-white upon a somewhat diaphanous ground, and are closer together down the posterior half of the surface than in front. The anterior part of the dorsal line is very short, oblique, and slightly concave, the posterior, on the contrary, being long and horizontally curved. The ventral or lower outline is scarcely at all excurved, and gently ascends towards the front. The umbo is remarkably curved over anteriorly, and being also directed at the tip away from the dorsal edge, would not touch that of the opposite valve when closed. The hinge-plate behind the beak exhibits a long, slightly curved groove for the reception of the ligament, and a single very strong tooth, cleft at the top, rests upon the anterior part (beneath the umbo), which is separated from the posterior portion by a deep broad concavity. The interior is glossy and marked with the external radiating lines. Neither the muscular scars nor the pallial line have been discovered.

Length $1\frac{3}{4}$ mm., height $1\frac{1}{4}$, probable diameter of complete shell $\frac{3}{4}$.

Habitat.—From the Reefs off Honolulu, Sandwich Islands, at a depth of 40 fathoms (Challenger); Sandwich Islands (Gould); Réunion or Bourbon (Deshayes).

One of the two valves obtained at this locality is destitute of the radiating white lines, and is less acutely beaked in front. Excepting the absence of the green colour, so characteristic of this curious shell, the presence in one instance of more numerous radiating white lines and the small size (due probably to difference of age) there does not appear at present any sufficient reason for considering the valves described above as specifically distinct. The want of colour may be the result of fading, and the extra acuteness of the rostrated end in one of the valves an unusual variation, as neither in Deshayes' figure, nor in specimens in the British Museum, does this part appear quite so acuminate.

The true systematic position of this curious genus has yet to be determined. Gould associated it with *Pedum* and *Vulsella*, whilst Deshayes placed it with the Mytilidæ.

Family Mytilidæ.

Subfamily Dreissenin.æ.

Septifer, Récluz.

Septifer bilocularis, (Linné).

Mytilus bilocularis, Linné, Syst. Nat., ed. 12, p. 1156.
Mytilus bilocularis, Wood, Ind. Test., pl. xii. fig. 17.
Mytilus nicobaricus, Chemnitz, Conch.-Cab., vol. viii. p. 155, pl. lxxxii. figs. 736, *a*, *b*.
Tichogonia bilocularis, Küster, Conch.-Cab., ed. 2, p. 10, pl. ii. figs. 11–17.
Tichogonia wiegmanni, Küster, *loc. cit.*, p. 11, pl. ii. figs. 6–10.
Tichogonia kraussii, Küster, *loc. cit.*, pl. vi. figs. 1–6.
Septifer bilocularis, Récluz, Rev. et Mag. Zool., 1848, p. 278.
Septifer bilocularis, Récluz, Rev. et Mag. Zool., 1849, vol. i. p. 125.
Septifer bilocularis, Martens, Moll. Mauritius, p. 318.
Mytilus nicobaricus, Reeve, Conch. Icon., vol. x. pl. ix. fig. 42.
Mytilus pilosus (Récluz, MS.), Reeve, *loc. cit.*, pl. viii. fig. 35.
Septifer cumingii, Récluz, Rev. et Mag. Zool., 1849, vol. i. p. 132.
Mytilus cumingianus, Reeve, *loc. cit.*, pl. xi. fig. 52.

Habitat.—Off Levuka, Fiji, in 12 fathoms.

The small shells described by Récluz as *Septifer cumingii* should not, I think, be separated from this species. They are said by Reeve (who wrongly quotes the species both orthographically and as undescribed) to have come from Panama, and Récluz gives their locality as "les côtes de l'île Annaa (près le détroit de Panama), dans l'océan-Pacifique." I have not been able to discover any island of that name near Panama, the only Annaa Island with which I am acquainted being situated in the Low Archipelago, east of Tahiti.

Many shells were collected by Mr. Cuming at the "Island of Annaa, Pacific Ocean," judging from Reeve's Conchologia Iconica, where it is very often mentioned. It therefore seems to me probable that the *Septifer cumingii* was collected at the same island in the Mid South Pacific and not in the Panama region.

Some minute shells were identified with this species by Carpenter (Mazatlan Cat., p. 120), and it is subsequently stated to be "common" at Cape St. Lucas, California (*vide* Moll. West. North America, 1872, p. 106).

After a careful comparison of the types of *Septifer cumingii* and *Septifer pilosus* with specimens of *Septifer bilocularis*, I am unable to discover any sufficient grounds for separating them specifically.

This species seems to be widely distributed throughout the Indian Ocean and in many parts of the Pacific.

Subfamily Mytilinæ.

Mytilus, Linné.

Mytilus edulis, Linné.

Mytilus edulis, Linné, Syst. Nat., ed. 12, p. 1157.

Habitat.—Station 322, off the Rio de la Plata, in 21 fathoms; Station 315, Falkland Islands, in 12 fathoms; and D'Urville Island, New Zealand.

This common species has become widely distributed, and differs considerably in form, colour, and size. Hutton quotes it as occurring in New Zealand, and I have already identified it as coming from Kerguelen Island (Phil. Trans. Roy. Soc., 1879, vol. clxviii. p. 189).

Mytilus magellanicus, Chemnitz.

Mytilus magellanicus, Chemnitz, Conch.-Cab., vol. viii. pl. lxxxiii. fig. 742.
Mytilus magellanicus, Reeve, Conch. Icon., vol. x. pl. vi. fig. 22.
Mytilus magellanicus, Smith, Phil. Trans., 1879, vol. clxviii. p. 188.

Habitat.—Station 315, Falkland Islands, in 12 fathoms; Betsy Cove, Kerguelen Island, on the shore; and Kandavu, Fiji.

A single small specimen from the last locality is apparently inseparable from this well-known species, which is also met with on the shores of New Zealand.

Mytilus exustus, (Lamarck) Reeve.

Mytilus exustus, (Lamarck) Reeve, Conch. Icon., vol. x. pl. iv. fig. 10.

Habitat.—Station 113A (?), St. Michael's Rocks, Fernando Noronha; and Station 122, off Pernambuco, in 350 fathoms.

The specimens from these localities belong to *Mytilus exustus* as identified by Reeve, but until an opportunity occurs of studying all the shells belonging to this striated group of *Mytilus*, it is impossible to say whether the species should or should not definitely retain this name. *Mytilus cubitus* of Say, *Mytilus variabilis* of Krauss, and a few other forms appear to be so very closely related that it would be hazardous to pronounce them either distinct or conspecific without a much longer study than I can at present bestow upon them.

Mytilus sulcatus, (Lamarck ?) (Reeve).

Modiola sulcata, (Lamarck) Reeve, Conch. Icon., vol. x. pl. x. fig. 74, sp. 61.

Habitat.—Wednesday Island, near Cape York, North Australia.

A number of dead valves, all that was obtained, undoubtedly belong to this species as figured by Reeve. There are in the British Museum also other specimens from the coast of Australia, and another series from Jamaica appears all but identical, but the dorsal angle in these specimens is more prominent, the sinuation in the outline behind it is more marked, and the radiating striæ are continued feebly right to the anterior end, whilst in the Australian examples there is a slight interruption of them near that extremity.

Mytilus hirsutus, Lamarck.

Mytilus hirsutus, Lamarck, Reeve, Conch. Icon., vol. x. pl. iii. fig. 8.
Mytilus hirsutus, Dunker, Ind. Moll. Japon., p. 222.
Mytilus (*Aulacomya*) *hirsutus*, Angas, Proc. Zool. Soc. Lond., 1865, p. 652.
Mytilus (*Aulacomya*) *hirsutus*, Angas, *op. cit.*, 1867, p. 928.

Habitat.—Port Jackson, Sydney, in 6 to 15 fathoms.

This species ranges from South Australia, also along the east coast, and as far north as China and Japan. It is also said by Angas to have been found at New Zealand, but this has not since been confirmed.

Mytilus meridionalis, n. sp. (Pl. XVI. figs. 3–3*a*).

Testa compressa, subovata, superne subacuminata, ad apicem obtusa, alta, alba, striis incrementi insculpta, prope umbones obsolete radiatim costata. Margo dorsi utrinque valde declivis, antice elongatus, postice brevior, minus obliquus. Cardo edentulus. Ligamentum magnum, subinternum, in fossa elongata, haud profunda, latiuscula situm. Pagina interna superne callosa, inferne tenuior, radiatim minute substriata, ad marginem acuta, simplex.

This species is much flattened, higher than long, irregularly ovate, and somewhat acuminate above. It is white, glossy, and striated by concentric lines of growth, some of which are more strongly marked than others. It is also sculptured with a few feeble ridges which radiate from the beaks. The dorsal margins are almost straight but unequal, the anterior being the longer and rather more sloping than the posterior. The umbo in both the valves under examination is prominent, and terminates in an obtuse apex, surrounded as it were by a thickened collar. In front of it in the right valve there is a narrow but very deep lunular excavation, and behind, in a broad shallow elongate groove on the toothless hinge-plate, is placed the ligament, which may be described as subexternal, as it would be slightly visible when the valves were closed. The interior is thickened at the upper part with a minutely rugose, dull, shelly deposit, becoming thinner as the lower margin is approached, and displaying a faint radiate substriation. The pallial line and muscular scars are indistinct.

Length 5 mm., height 6, diameter $2\frac{2}{3}$.

Habitat.—Station 150, between Kerguelen and Heard Islands, in 150 fathoms, coarse gravel; and off Prince Edward Island, in 100 to 150 fathoms.

The above is the supposed diameter of a complete shell, being double that of the valve obtained at Station 150, which is presumed not to be adult. It may be only a variety of *Mytilus kerguelensis*, but its form is very different, and the radiating lines are stronger and fewer.

Mytilus kerguelensis, n. sp. (Pl. XVI. figs. 4–4*a*).

Testa parva, solidiuscula, alba, epidermide flavescenti, hirsuta induta, incrementi lineis striata, lirisque tenuissimis, radiantibus instructa, antice acuminata, postice dilatata. Pagina interna alba, nitida. Linea cardinis crassiuscula, edentula.

This little species may be recognised by its white colour and the brownish-yellow, hairy, or chaffy epidermis. It is rather solid, concentrically and radiately striated, narrowed in front and dilated behind. The dorsal outline is arched without an angle, the ventral being straighter. The interior of the valves is white and somewhat glossy. The hinge-line is rather thick and toothless.

Length 8 mm., height 5, diameter $3\frac{1}{2}$.

Habitat.—Station 149, Royal Sound, Kerguelen Island, on the shore.

The tips of the umbones in this species are also capped as in *Mytilus meridionalis*.

Mytilus (*Stavelia*) *horridus*, Dunker.

Mytilus horridus, Dunker, Proc. Zool. Soc. Lond., 1856, p. 359.
Mytilus horridus, Reeve, Conch. Icon., vol. x. fig. 9.
Mytilus tortus, (Dunker) Reeve, *loc. cit.*, fig. 6.
Stavelia torta, Gray, Proc. Zool. Soc. Lond., 1858, p. 90, pl. xli. figs. 1–1*a*.

Habitat.—Station 186, off Cape York, North Australia, in 8 fathoms (Challenger); Cape Capricorn, North Australia, and Island of Mindanao, Philippines (Reeve).

I agree with Gray in uniting the above species, but do not consider the sinuosity of the ventral margin of generic importance. Reeve states that Dunker described *Mytilus tortus* in Proc. Zool. Soc. Lond., 1856, but I only there find a mere reference to that name by the latter author in his description of *Mytilus horridus*, and I have been unable to trace any account of it in any other work. The Challenger shell is very large, being $6\frac{1}{2}$ inches in length.

Modiola, Lamarck.

Modiola barbata (Linné).

Mytilus barbatus, Linné, Syst. Nat., ed. 12, p. 1156.
Mytilus barbatus, Jeffreys, Brit. Conch., vol. ii. p. 114, vol. v. pl. xxvii. fig. 3.
Modiola barbata, Forbes and Hanley, Brit. Moll., vol. ii. p. 190, pl. xliv. fig. 4.

Habitat.—Station 233A, Kobé, Japan, in 50 fathoms sand.

The European *Mytilus modiolus* is already known as an inhabitant of Japanese waters, but this is, I believe, the first record of the occurrence of *Modiola barbata*, another well-known form on many parts of the coast of Europe.

Modiola capax, as figured by Reeve, is very closely related to, if not identical with, this species.

Modiola glaberrima (Dunker).

Volsella glaberrima, Dunker, Proc. Zool. Soc. Lond., 1856, p. 363.
Modiola glaberrima, Reeve, Conch. Icon., vol. x. pl. viii. fig. 48.
Perna glaberrima, Angas, Proc. Zool. Soc. Lond., 1867, p. 929.
Modiola glaberrima, Smith, Report "Alert" Mollusca, p. 108.

Habitat.—Port Jackson, Sydney, in 6 to 15 fathoms.

This species has not, I believe, been recorded from any other locality than the Sydney district.

Modiola watsoni, n. sp. (Pl. XVI. figs. 5–5*c*).

Testa fragilis, subpellucida, albida, marginem dorsalem versus inferneque viridi tincta, polita, incrementi lineis striata, pone umbones subfortiter corrugata. Valvæ in medio convexæ, postice compressæ, latæ, arcuatæ, antice angustatæ. Margo dorsi posterior leviter convexus, ventrali medio levissime incurvato. Umbones parvi, approximati, iridescentes. Pagina interna alba, parum nitida.

This species is very fragile, semitransparent, white, stained with pale olive-green along the dorsal margin, and upon the lower portion of the valves. The valves are moderately convex at the centre and become compressed behind. They are very narrow at the anterior end and sharply rounded, gradually widen posteriorly, and terminate in a broadly arcuate end. The dorsal margin rises considerably behind, and is faintly convex, the ventral, on the contrary, being feebly incurved.

The sculpture consists of fine concentric lines of growth, and excessively minute radiating lines, not incised striæ. In addition to this, the dorsal surface for some distance behind the umbones exhibits several plications or wrinklings. The beaks are small, incurved, somewhat iridescent, situated at a short distance from the anterior extremity.

The interior is white and not glossy, but this may not always be the case in specimens found living, the only shells under examination having been dredged without the animals.

Length 43 mm., height 22, diameter 13½.

Habitat.—Station 207, west of the Island of Luzon, Philippines, at a depth of 700 fathoms; also Station 191, near the Arrou Islands, in 800 fathoms.

The specimens from the latter locality have not attained so large a size as the single example from off the Philippines, the dimensions of which are given above. They are not quite so gently arcuate at the posterior end, have the ventral outline slightly convex, and exhibit a few distinct scratch-like striæ across the anterior lower portion of the valves at right angles to the lines of increment. In the type I also find a few traces of similar striæ.

This species belongs to that section of the genus which includes *Modiola arborescens*, Chemnitz, *Modiola glaberrima*, Dunker, *Modiola elegans*, Gray, *Modiola perfragilis*, Dunker, and a few others, characterised by light fragile shells with a highly glossy surface. The last of the above-mentioned forms most resembles that now described. It is, however, much narrower, has no dorsal plications or wrinkles, and is not quite so fragile and iridescent within.

Both the large and small specimens of *Modiola watsoni*, so named in honour of my friend the Rev. R. Boog Watson, have more or less of a rust-like incrustation adhering to the anterior or umbonal region, which in the former has stained the surface yellowish-brown.

Lithodomus, Cuvier.

Lithodomus antillarum (Philippi).

Modiola (*Lithophagus*) *antillarum*, Philippi, Zeitschr. Malakozool, 1847, p. 116.
Modiola antillarum, Philippi, Abbild., vol. iii. p. 20, pl. ii. fig. 4.
Lithodomus antillarum, Reeve, Conch. Icon., vol. x. pl. ii. fig. 7.
Lithodomus niger, d'Orbigny, in Sagra's Hist. Cuba, Mollusques, vol. ii. p. 331, pl. xxviii. figs. 10. 11.
Lithophaga nigra, Dunker, Conch.-Cab., ed. 2, p. 12.

Habitat.—Bermuda, boring in coral.

The *Lithodomus antillarum* described by d'Orbigny in the above work (p. 332) appears to be identical with *Lithodomus corrugatus* of Philippi.

Lithodomus appendiculatus (Philippi).

Modiola appendiculata, Philippi, Abbild., vol. ii. p. 150, pl. i. fig. 4.
Lithodomus appendiculatus, Reeve, Conch. Icon., vol. x. pl. iv. fig. 21.
Lithophaga appendiculata, Dunker, Conch.-Cab., ed. 2, p. 15, pl. v. fig. 14.
Lithodomus bisulcatus, d'Orbigny, in Sagra's Hist. Cuba, Mollusques, vol. ii. p. 333, pl. xxviii figs. 14–16.

Habitat.—Bermuda, boring in coral (*Oculina bermudiana*).

This species has been recorded from Cuba (Philippi); Jamaica, Martinique, Guadaloupe, and St. Domingo (d'Orbigny).

Lithodomus malaccanus, Reeve.

Lithodomus malaccanus, Reeve, Conch. Icon., vol. x. pl. iv. fig. 20.
Lithophaga malaccana, Dunker, Conch.-Cab., ed. 2, p. 20, pl. v. fig. 1.

Habitat.—Station 186, off Cape York, North Australia, in 8 fathoms.

The anterior end of this species is rounded, but the hinder extremity of the shell, which can only be seen when the valves are parted, is more truncate and only a little arcuate. The interior is of a pale brown tint, and more or less iridescent.

Subfamily Crenellinæ.

Crenella, Brown.

Crenella marionensis, n. sp. (Pl. XVI. figs. 6–6*a*).

Testa parva, tenuis, alba, nitida, paulo obliqua, subcordata, convexiuscula, superne lata, inferne angustata, radiatim tenuiter lirata, liris incrementi striis decussatis. Umbones rotundati, vix elevati, ad apices obtusi, semipellucidi. Linea cardinalis angusta, minutissime transversim striata, in medio, infra umbonem fossa ligamenti curvata transversa insculpta, prominentia dentiformi laterali postica in valva sinistra instructa. Pagina interna subnitens, umbones versus minute subpunctata, inferne radiatim tenuiter sulcata, ad marginem subtiliter denticulata.

This is a very thin, delicate species, white, glossy, and sculptured with numerous fine radiating liræ which are scarcely raised at all and crossed by the concentric lines of growth. This ornamentation is so fine that it is all but invisible to the naked eye. The form is oblique, somewhat cordate, rather convex, broader above towards the umbones than at the lower end. The posterior side is regularly broadly curved in an oblique direction, the anterior being more erect and straighter. The umbones are moderately large, not much elevated, and terminate in a rounded semipellucid tip. The hinge-plate is narrow, microscopically transversely striated, has an elongate, narrow, central ligamental groove and a single more or less distinct lateral tooth-like projection on the hinder side in the left valve, and an indication of one in the right. The interior of the valves under the microscope appears towards the umbones to be subpunctate, and is finely striated towards the minutely dentate margin.

Length 4 mm., height 4$\frac{1}{2}$, diameter 2$\frac{2}{3}$.

Habitat.—Station 145, off Marion and Prince Edward Islands, in 140 fathoms.

This is a more fragile species than the northern *Crenella decussata* of Montagu, more shouldered above, more finely sculptured, and different in its hinge, but not sufficiently so to warrant a generic separation.

Modiolaria, Beck.

Modiolaria lanigera (Dunker).

Lithodomus laniger, (Dunker MS.), Reeve, Conch. Icon., vol. x. pl. v. fig. 30.
Lithodomus barbatus, Reeve, *loc. cit.*, fig. 27.
Modiolaria barbata, Angas, Proc. Zool. Soc. Lond., 1867, p. 911, pl. xliv. fig. 12.

Habitat.—Port Jackson, in 2 to 10 fathoms (Challenger); Sydney (Reeve); Botany Bay, New South Wales (Angas).

I fail to appreciate the differences between the above species. Angas was evidently misled by Reeve having described this shell as a *Lithodomus*.

Modiolaria cumingiana, Dunker.

Modiola cumingiana, (Dunker MS.), Reeve, Conch. Icon., vol. x. pl. ix. figs. 63, *a*, *b*, sp. 50.
Crenella (*Modiolaria*) *cumingiana*, Angas, Proc. Zool. Soc. Lond., 1865, p. 653.

Habitat.—Port Jackson, Sydney, in 2 to 10 fathoms.

This species has also been found at Moreton Bay on the east coast of Australia (Reeve), at Swan River on the west coast (British Museum), and at St. Vincent's Gulf, on the south coast, amongst *Zostera*, in 1 to 3 fathoms (Angas), and finally in Mr. Cuming's collection there is a pretty pink variety labelled as having come from the Red Sea.

Modiolaria varicosa, Gould.

Modiolaria varicosa, Gould, Proc. Boston Soc. Nat. Hist., 1861, vol. viii. p. 37; Otia Conch., p. 176.
Modiolaria varicosa, Smith, Report on "Alert" Collections, p. 109, pl. vii. figs. M, M.
Modiola striata, (Young) Reeve, Conch. Icon., vol. x. pl. xi. fig. 83.

Habitat.—Port Jackson, Sydney, 2 to 10 fathoms.

This species has not, I believe, been as yet noticed from any other than the Sydney district.

Modiolaria cuneata, Gould (Pl. XVI. figs. 7–7*a*).

Modiolaria cuneata, Gould, Proc. Boston Soc. Nat. Hist., 1861, vol. viii. p. 38; Otia Conch., p. 176.

Habitat.—Port Jackson, Sydney, in 6 to 15 fathoms (Challenger); False Bay, Cape of Good Hope (Gould).

This species is not quite so elongate as the European *Modiolaria marmorata* of Forbes, but corresponds in other respects, so that it is questionable whether it should not take varietal rather than specific rank.

Another species described by Fischer under this name (Journ. de Conch., vol. xxx. p. 53) may be called *Modiolaria fischeri*. It was dredged in the Bay of Biscay, at a depth of 1160 metres.

Modiolaria semigranata (Reeve).

Lithodomus semigranatus, Reeve, January 1858, Conch. Icon., vol. x. pl. v. figs. 28, *a*, *b*.
Modiola subclavata, Libassi, Atti Accad. Sci. Palermo, 1859, vol. iii. p. 13, fig. 7.

Habitat.—Station 70, west of the Azores, in 1675 fathoms (Challenger); Lanzerote and Tenerife (M'Andrew).

None of the specimens from this locality are as large as the fossil shells figured by Libassi. In the living state they are more or less covered with a yellowish epidermis, which is of a hirsute character on the posterior portion of the valves. They vary considerably in form, some being longer and narrower than others; all, however, exhibit the median sinuation at the ventral margin. The largest of them is only $5\frac{1}{2}$ mm. in length, but a specimen from Lanzerote presented to the British Museum by the late R. M'Andrew, Esq., exceeds that by 2 mm.

Modiolarca, Gray.

Modiolarca trapezina (Lamarck).

Modiola trapesina, Lamarck, Anim. sans vert., ed. 2, vol. vii. p. 24.
Modiola trapezina, Küster, Conch. Cab., vol. viii. Heft. iii. pl. vi. figs. 16, 17.
Modiolarca trapezina, Gray, Synopsis Brit. Mus., 1840, p. 151; Proc. Zool. Soc. Lond., 1847, p. 199.
Modiolarca trapezina, H. and A. Adams, Gen. Rec. Moll., vol. iii. pl. cxxii. figs. 1, 1*a*.
Modiolarca trapezina, Chenu, Man. de Conch., vol. ii. p. 156, fig. 777.
Phascolicama trapezina, Hupé, Gay's Hist. Chile, Malacologia, pl. viii. fig. 9.
Phascolicama magellanica, Rousseau, Voy. au Pol. Sud. Moll., p. 116, pl. xxvi. figs. 2, *a–d*.
Gaimardia trapesina, Gould, Wilkes's United States Explor. Exped., pl. xli. fig. 568.

Habitat.—Station 311; off the coast of Patagonia, in 245 fathoms, a single dead valve only. Station 315, off the east side of the Falkland Islands, living at a depth of 12 fathoms; also dead shells at Marion Island, south-east of the Cape of Good Hope, in 50 to 100 fathoms; and finally in Royal Sound, Kerguelen Island, "on the surface," no doubt attached to floating Algæ, and also dead, in 28 fathoms.

The form of this species is somewhat variable, especially with regard to the anterior end, some specimens (*vide* Gould's figure) having this part considerably narrower and more prolonged than others. The hinge is generally composed of a single small

tubercular tooth in each valve, and I have never met with any specimen having double this number as is stated to be the case by Messrs. Adams and Chenu. Sometimes these tubercles may be wanting in one or even in both valves, the latter being apparently a rare occurrence.

Modiolarca kerguelensis, n. sp. (Pl. XVI. figs. 8–8*a*).

Testa fragilis, alba, aliquanto iridescens, incrementi lineis striata, elongata antice angustata, postice altior, curvatim oblique truncata, mediocriter convexa. Margo dorsi posticus perelongatus, fere rectilinearis, rotundo-angulatim cum latere postico junctus. Margo ventris antice indistincte subsinuatus, post medium late curvatus leviterque adscendens, acute rotundatim in lateralem ambiens. Latus anticum brevissimum, subacutum, posticum longissimum, latum. Umbones mediocriter prominentes, ad apicem obtusi, circiter in $\frac{1}{5}$ longitudinis positi. Pagina interna paulo nitida. Cicatrix antica præcipua, subprofunda, elongata, postica indistincta. Dentes duo cardinales in utraque valva, anterioribus majoribus. Ligamentum internum elongatum, angustum, ligamento externo perelongato, marginali.

This species is oblong, trapezoidal, broader behind than in front, very thin, white, a little glossy and iridescent, and sculptured with very fine concentric lines of growth. The valves are moderately convex, very inequilateral, the umbones, which are small, only a little prominent, and terminate in an obtuse smooth glossy boss, being situated far in front, at about one-sixth of the whole length from the anterior extremity. The anterior dorsal margin is short, nearly straight, and very oblique, forming, with the upcurving lower margin, a sharply rounded (almost beaked) end. The hinder margin is long, subrectilinear, and directed slightly upwards. The ventral outline is broadly arcuate, with a slight incurvation or sinus, a trifle in front of the centre. The posterior end is faintly arcuate, oblique, and joins the upper and lower margins with rounded angles. The hinge-plate is very slender, and furnished with two unequal teeth in each valve, of which the anterior ones are larger than the posterior, that in the left valve being shaped like an inverted letter V, thus Λ. Behind the teeth there is a distinct elongate groove for the reception of the internal ligament. The external ligament is very long, extending from in front of the umbones nearly the whole length of the dorsal margin, to which it is attached. The interior of the valves is white and a little glossy. The anterior muscular impression is rather deep, and defined on the posterior side by a straightish thickened edge, and above this there are indications of a second smaller scar. The posterior cicatrix and the pallial line are very indistinct.

Length 13 mm., height 8, diameter $5\frac{1}{2}$.

Habitat.—Off Royal Sound, Kerguelen Island, in 25 fathoms.

This species is remarkable for the iridescent gloss of the exterior, its elongate form, well-developed hinge-teeth, and the distinct internal ligament.

Myrina, H. and A. Adams.

Myrina coppingeri, n. sp. (Pl. XVI. figs. 9–9*b*).

Testa oblonga, antice angustata, valde inæquilateralis, epidermide viridi-flavescente induta, concentrice tenuiter striata. Margo dorsi postieus elongatus, rectus, paulo sursum inclinatus, ventralis rectiusculus, vel in medio vix sinuatus. Linea cardinalis crassiuscula, transversim striata, in medio ligamento fere ommino interno interrupta. Pagina interna cæruleo-albida, iridescens.

This species is oblong, convex, about twice as long as high, considerably narrower at the anterior end than behind. It is moderately strong, covered with a greenish-yellow epidermis, and finely concentrically striated. The posterior dorsal margin gradually ascends from the umbones, and is rectilinear, the ventral outline being also straightish, but very slightly incurved at the middle. The umbones incline over towards the front, and are situated at about one-sixth of the entire length from the anterior extremity. The hinge-line is rather strong, striated across at both ends, and interrupted at the middle by the brown ligament, which is internal and scarcely at all visible externally. The interior is bluish-white, a little glossy and iridescent.

Length 9 mm., height $4\frac{3}{4}$, diameter $3\frac{1}{2}$.

Habitat.—Station 184, east of Cape York, North Australia, in 1400 fathoms; Globigerina ooze.

This differs from the only known species of the genus in having the hinge-line finely striated across on each side the ligament. *Idas* of Jeffreys has the hinge-plate similarly crenated, but the ligament is described as external.

Idas, Jeffreys.

Idas dalli, n. sp. (Pl. XVI. figs. 10–10*b*).

Testa elongata, obliqua, parva, pellucida, nitida, insigniter inæquilateralis, tenuissima, modioliformis. Linea cardinalis brevis, recta; latera obliqua, postieum leviter arcuatum, anticum longius, in medio incurvatum. Umbones parvi, acuti, parum prominentes, ante medium lineæ cardinalis denticulatæ collocati.

This little species is very narrow and elongate, thin, semitransparent, white, glossy, almost destitute of sculpture, exhibiting only traces of fine lines of growth. It is oblique in regard to the straight hinge-margin, the hinder side being slightly excurved, and the anterior a little sinuate at the middle, the sinus marking a faint depression which radiates from the umbones down both valves. The beaks are small, a little prominent

beyond the dorsal line, and situated rather in front of the centre of it. The hinge-line is slender and finely dentate nearly from end to end, some of the denticles near the middle being the smallest, and a few at the posterior extremity the largest. The interior is glossy, but hardly pearly, the muscular scars being indistinct.

Length $5\frac{1}{2}$ mm., height $2\frac{1}{2}$, diameter 2.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

This curious species is not "nacreous" like the type of the genus *Idas*, and of a very different form. I cannot discover in any of the odd valves (no complete specimen was obtained) any trace either of an internal or external ligament. It is, I expect, of a very slight character, and marginal.

Dacrydium, Torell.

Dacrydium vitreum (Möller).

Modiola (?) vitrea, Möller, Ind. Moll. Grönl., p. 19.
Dacrydium vitreum, Torell, Spitzbergens Molluskenfauna, p. 138, pl. i. figs. 2, *a*, *b*.
Dacrydium vitreum, Jeffreys, Ann. and Mag. Nat. Hist., 1876, vol. xviii. p. 429.
Dacrydium vitreum, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 569.
Dacrydium vitreum, Sars, Moll. Reg. Arct. Norv., p. 28, pl. iii. figs. 2, *a*, *b*.

Habitat.—Stations 73 and 78, west and east of the Azores, in 1000 fathoms.

For the synonymy and distribution of this species reference should be made to the above quoted papers by the late Dr. Gwyn Jeffreys.

Dacrydium occidentale, n. sp. (Pl. XVII. figs. 1–1*a*).

Testa *Dacrydio vitreo* similis, sed magis quadrata, margine inferiori magis incurvato, dorsali minus convexo.

This species resembles *Dacrydium vitreum* in colour, texture, sculpture, and hinge, but appears to be constant in its difference of form. It is not quite so convex, has a less peaked anterior end and a more oblong-squarish appearance, the margin behind the umbones being less sloping backwards, the arcuation at the middle less prominent, and the ventral outline more concave.

Length $4\frac{1}{2}$ mm., height $2\frac{2}{3}$, diameter $1\frac{2}{3}$.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

Dacrydium meridionalis, n. sp. (Pl. XVII. figs. 2–2*a*).

Testa tenuis, alba, irregulariter subpyriformis, mediocriter inflata, liris tenuibus concentricis aliisque paucis radiantibus cancellata, striis incrementi sculpta. Umbones parvi, ad apicem obtusi, peculiariter clypeati. Margo cardinalis mediocriter elongatus, rectus, inferior late rotundatus. Latus anticum leviter incurvatum, posticum excurvatum.

Linea cardinis mediocriter lata, in medio sulco ligamenti elongato arata, utrinque transversim minute striata. Pagina interna nitida, microscopice subpunctata, margine postico crenulato.

This species has the form of certain *Modiolæ*, the anterior side being produced upwards so that the beaks are not apical. It is thin, white, somewhat glossy, moderately tumid, and irregularly pear-shaped. The anterior side is slightly incurved where the byssus would pass between the valves. The hinder margin is broadly excurved and the lower outline well rounded. The umbones are small, terminate in a remarkable, obtuse shield defined by a raised edge or collar. They incline towards the front, and are much nearer that end of the hinge-plate than the posterior. This is rather broad, bears a conspicuous long ligamental groove commencing in front under the beak and extending backwards in a slightly oblique direction, and both in advance of the furrow and behind it is finely striated across. The interior of the valves is glossy, minutely subpunctate, and has the posterior margin armed with a few denticles. The exterior sculpture consists of fine lines of growth, coarser concentric liræ, and radiating ridges, which appear to vary in number in different specimens.

Length 4½ mm., height 6, diameter 3.

Habitat.—Prince Edward and Marion Islands, in 100 to 150 fathoms (about 1200 miles south-east of the Cape of Good Hope).

This species probably attains larger dimensions than those given above. It differs from the typical species of the genus (*Dacrydium vitreum*) in having the hinge-plate striated across in front of, as well as behind the beaks, in the character of the ligamental furrow, and in the tips of the umbones.

Family PINNIDÆ.

Pinna, Linné.

Pinna tasmanica, Tenison-Woods (?).

Pinna tasmanica, Tenison-Woods, Proc. Roy. Soc. Tasman., 1875, p. 161.

Habitat.—Station 162, off east Moncœur Island, Bass Strait, in 38 fathoms; sand and shells.

The single specimen from this Station accords very fairly with Mr. Tenison-Woods brief diagnosis; but, where so much depends on form in the determination of species, it is almost impossible to identify with certainty without a good illustration or reference to the figure of a closely allied form. The specimen at hand is very like Reeve's figure of *Pinna carolinensis*[1] (=*Pinna subviridis*, Reeve), both as regards outline and colour. It differs, however, in having fewer ridges and much larger scales. There are five

[1] Conch. Icon., vol. xi. pl. xxxiv. fig. 66.

principal ribs at rather equal distances, the first forming the straightish dorsal line. In addition, towards the umbones, there is a slighter ridge in each space between the large ribs which soon becomes obsolete. Also near the ventral margin there are four or five obsolete ridges, which are chiefly indicated by that number of rows of moderately distant small scales. The scales on the principal costæ are very large, rather tubular and elevated.

Family AVICULIDÆ.

Malleus, Lamarck.

Malleus albus, Lamarck.

Malleus albus, Lamarck, Anim. sans vert., ed. 2, vol. vii. p. 91.
Malleus albus, Reeve, Conch. Icon., vol. xi. pl. i. fig. 1.
Malleus albus, Chenu, Man. Conch., vol. ii. fig. 815.

Habitat.—Cape York, in 3 to 12 fathoms.

This well-known shell has been recorded from Japan, China, and Philippine Islands, and probably has a still wider distribution in eastern seas.

Avicula (Klein), Bruguière.

Avicula macroptera, Lamarck.

Avicula macroptera, Lamarck, Anim. sans vert., ed. 2, vol. vii. p. 97.
Avicula macroptera, Reeve, Conch. Icon., vol. x. pl. ii. fig. 2.
Avicula macroptera, Dunker, Conch.-Cab., ed. 2, p. 22, pl. vii.

Habitat.—Station 186, off Cape York, North Australia, in 8 fathoms; coral mud.

This large species is also said to have been obtained at the Moluccas.

Avicula (*Meleagrina*) *muricata*, Reeve.

Avicula muricata, Reeve, Conch. Icon., vol. x. pl. vi. fig. 12.
Avicula (*Meleagrina*) *muricata*, Dunker, Conch.-Cab., ed. 2, p. 47, pl. xvi. fig. 2.

Habitat.—Station 187, near Cape York, North Australia, in 6 fathoms; coral mud.

All the Challenger specimens of this species are young shells. Reeve's figure was taken from a specimen which was to some extent broken on the posterior side, so that the sinus at the upper part appears too deep. A feature worth remarking is the fine radiate ridges on the anterior auricle.

Avicula (*Meleagrina*) *squamulosa*, Lamarck.

Avicula squamulosa, Lamarck, Anim. sans vert., ed. 2, vol. vii. p. 100.
Avicula squamulosa, d'Orbigny, Voy. dans l'Amér. Mérid., p. 658.
Avicula squamulosa, d'Orbigny, in Sagra's Hist. Cuba, Mollusques, vol. ii. p. 342.

Habitat.—Station 36, off Bermuda, in 30 fathoms; coral.

This species, which was originally described from Brazilian specimens, will, I believe, include several others from the Caribbean Sea, namely, *Avicula flabellum*, Reeve, *Avicula chamoides*, of the same author, and apparently the young of the preceding, *Avicula horrida* of Dunker, *Avicula ala-perdicis* of Reeve, and possibly one or two more.

Avicula (*Meleagrina*) *smaragdina*, Reeve.

Avicula smaragdina, Reeve, Conch. Icon., vol. x. pl. xii. fig. 45.
Avicula smaragdina, Smith, Report "Alert" Coll., p. 113.

Habitat.—Off Cape York, in 3 to 12 fathoms.

This species was collected by Dr. Coppinger of H.M.S. "Alert" on the coast of North-east Queensland, and was presumed by Reeve to have come from the Moluccas.

Perna, Bruguière.

Perna samoensis, Baird.

Perna (*Isognomon*) *samoensis*, Baird, in Brenchley's Cruise of the "Curaçoa," p. 454, pl. xlii. fig. 8.

Habitat.—On the reefs at Samboangan, Philippine Islands, in 10 fathoms; also on the reefs at Honolulu, Sandwich Islands.

This species was described from specimens collected at Tutuila, one of the Samoa Islands, and other examples of it from the Keeling Islands in the Indian Ocean are in the collection of the British Museum. It is readily recognised by the radiating brown lines which run between and not upon the slightly raised ridges as stated by Baird. These lines, which cannot be called purple, exist only on the convex valve. The form of this shell is very variable, some of the Keeling specimens being extraordinarily produced into a wing-like projection behind.

Perna vitrea, Reeve.

Perna vitrea, Reeve, Conch. Icon., vol. xi. pl. ii. fig. 10.

Habitat.—Hilo, Sandwich Islands.

Reeve gives the Red Sea as the locality of this species, but I should state that the specimens in Cuming's collection are marked with the locality "Sandwich Islands." The description of the colour of this shell in the Conchologia Iconica ("of a shining, dark, chestnut-red colour") does not well apply either to the types or the Challenger specimens. The figure, however, is more correct in this respect, the pale zones being, however, a little exaggerated. At a more mature age than the shell depicted, the posterior end becomes somewhat winged.

Family Spondylidæ.

Spondylus, Linné.

Spondylus zonalis, Lamarck.

Spondylus zonalis, Lamarck, Anim. sans vert., ed. 2, vol. vii. p. 191.
Spondylus zonalis, Chenu, Ill. Con., p. 5, pl. vii. figs. 3, 4.
Spondylus zonalis, Martens, Moll. Mauritius, &c., p. 313.
Spondylus zonalis, Reeve, Conch. Icon., vol. ix. pl. viii. figs. 29, *a*, *b*.
Spondylus zonalis, Sowerby, Thes. Conch., vol. i. p. 429, figs. 12, 18, 27, 60.
Spondylus herinaceus, Chenu, *op. cit.*, p. 6, pl. xxv. figs. 3, 4.

Habitat.—Station 186, off Cape York, in 8 fathoms: coral mud.

One of the two specimens from this locality agrees very fairly with the variety figured by Reeve (fig. 29*b*). The other has the upper or free valve white, with the exception of a few dark spots towards the umbones. Some of the spines near the outer margin are tinted with fleshy orange, and the lower valve has more of the colour. The interior is white, with a rich orange-red border, within which is a narrow zone of a pale olive-brownish tint, becoming darker towards and upon the hinge-teeth. The margin in the other example is not nearly so vivid, and of a lilac colour, and, like that of the other shell, is zoned within with olive-brown. The species has been recorded from the Mauritius and the Philippine Islands.

Spondylus victoriæ, Sowerby.

Spondylus victoriæ, Sowerby, Proc. Zool. Soc. Lond., 1859, p. 428, pl. xlix. fig. 8.
Spondylus victoriæ, Smith, Report "Alert" Coll., p. 114.
Var. = *Spondylus wrightianus*, Crosse, Journ. de Conch., 1872, vol. xx. p. 360, vol. xxi. p. 253, pl. ix. figs. 1, 1*a*.

Habitat.—Station 188, south of New Guinea, in 28 fathoms: green mud.

The specimens from this locality belong to the var. *wrightiana*, having straight, pointed spines. Remarks on the distribution of this species will be found in the Report on the "Alert" collections.

Plicatula, Lamarck.

Plicatula ramosa, Lamarck.

Plicatula ramosa, Lamarck, Anim. sans vert., ed. 2, vol. vii. p. 176.
Plicatula ramosa, Hanley, Recent Shells, p. 288.
Spondylus barbadensis, Petiver, Gazophil., pl. xxiv. fig. 12.

Habitat.—Station 322, off the mouth of the Rio de la Plata, in 21 fathoms; sand and shells.

The shells from this locality, which I associate with this West Indian species, are usually pyriform, and rather compressed, the free valves being almost flat, and invariably

shallower than the attached valves. They are more or less tinted with reddish-brown externally, and, with the exception of a narrow pale brownish border, are uniformly white within. The plicæ are rather similar in most specimens, not very large, and sometimes interrupted towards the apex. The attached valves may be almost entirely or but very little adherent.

Plicatula sp.

Habitat.—Amboina, 15 to 20 fathoms; and Flinders Passage, North Australia, in 7 fathoms.

A single valve from each of these localities probably belongs to *Plicatula imbricata*, as identified by Sowerby in his monographs in the Thesaurus Conchyliorum and the Conchologia Iconica, but on account of the bad condition of the one, and the immaturity of the other, I cannot affirm so definitely.

Family Limidæ.

Lima, Bruguière.

Lima squamosa, Lamarck (juv.).

Lima squamosa, Lamarck, Anim. sans vert., ed. 2, vol. vii. p. 115.
Lima squamosa, Lischke, Japan, Meeres-Conch., Theil. i. p. 162.

Habitat.—Off Tenerife, in 70 fathoms; and Station 212, south of Mindanao, Philippine Islands, in 10 fathoms.

Only a single minute valve was obtained of this well-known species off Tenerife, and a small perfect specimen at the Philippines. Its distribution is fully discussed by Lischke in the above-named work. The British Museum collection contains specimens from the Red Sea, Ceylon, Philippine Islands, Darnley Island, the Louisiade Archipelago, and New Zealand. After a careful examination and comparison of these specimens with Mediterranean examples, I have failed to discover any constant specific differences. The shells may, as a rule, appear rather broader and the ribs a little stouter; but other intermediate forms occur, so that it seems impossible to draw a line of separation. The *Lima pauci-costata* of the Conchologia Iconica, which may be different from that of the Thesaurus Conchyliorum, I also consider a variety of this species.

Lima lata, n. sp. (Pl. XXIV. figs. 3–3*a*).

Testa subcompressa, fere clausa, inæquilateralis, obliqua, lata, antice oblique truncata, profunde excavata, postice primo prope marginem dorsalem leviter incurvata, deinde late arcuata, inferne semicirculariter curvata. Valvæ mediocriter crassæ, albæ, costis radian-

tibus circiter 36, plus minusve spinulis brevibus subacutis cavis ornatis, instructa. Interstitia costis angustiora, mediocriter profunda, transversim rugose striata. Area dorsalis profunde excavata, cuneiformis, fossa ligamentali triangulari sculpta. Pagina interna nitida, haud profunde radiatim sulcata.

Length 36 mm., height 42, diameter $15\frac{1}{2}$.

Habitat.—Station 109, off St. Paul's Rocks in the Atlantic, north-east of Brazil, in 104 fathoms; and Station 201, off the west side of Mindanao, Philippine Islands, in 82 fathoms.

This fine species is very like *Lima squamosa*, but is broader and has more numerous, finer, and more sharply spined ribs. The anterior straight slope is shorter, the peculiar, triangular ligament-pit is quite different, and the angle formed at the umbones by the dorsal and anterior margins is less acute.

In reckoning the number of ribs as thirty-six, it should be observed that the very fine ones on the front excavation are not included. The anterior auricles are almost obsolete, and indeed invisible when the valves are regarded sideways, being hidden within the concavity. The hollow spines on the costæ are rather pointed, long, and a little curved. The interior of the valves is glossy, and, with the exception of the upper portion, which is thickened with a shelly deposit, is shallowly grooved and ridged, the grooves corresponding to the external ribs.

The few specimens from the Philippines are all of small size, the largest being only a third the length of the unique shell from the Atlantic. After a very careful study of them I cannot discover any grounds for their separation, the form being the same, the ligament of a similar shape, and the costæ only two or three fewer. It therefore appears that this species, like *Lima squamosa*, occurs in very remote localities.

Lima multicostata, Sowerby (= *Lima caribæa*, d'Orbigny), has about the same number of ribs as this species, but is of the same form as *Lima squamosa*.

The differences which distinguish these three forms are but very slight, and it is not improbable that all belong to one and the same species, and it is curious to note that each of them occurs both in the Atlantic and Pacific. Other closely allied species are *Lima tetrica*, Gould, from the Gulf of California, *Lima bullifera*, Deshayes, from Réunion, and *Lima zealandica*, Sowerby, from New Zealand.

Lima multicostata, Sowerby.

Lima multicostata, Sowerby, Thes. Conch., vol. i. p. 85, pl. xxii. fig. 38.
Lima multicostata, Sowerby, Conch. Icon., vol. xviii. pl. i. fig. 4.
Lima caribæa, d'Orbigny, Sagra's Hist. Cuba, Mollusques, vol. ii. p. 337; Atlas, pl. xxviii. figs. 17–19.

Habitat.—Port Jackson, New South Wales, in 2 to 18 fathoms; and Station 172, off Tongatabu, in 18 fathoms; also Station 56, off Bermuda, in 1075 fathoms.

This species, which I cannot separate from *Lima caribæa*, is said to be Mediterranean by Mr. Sowerby, and he is probably correct. In the British Museum there are specimens from Port Stephens, Raine Island, Torres Strait, and Kangaroo Island, which appear to be absolutely identical in every respect. It resembles *Lima squamosa* in form, but has many more and finer ribs, which have more delicate prickles upon them.

Lima tahitensis, n. sp. (Pl. XXIV. figs. 4–4*a*).

Testa brevis, oblique subquadrata, compressa, inæquilateralis, alba, antice excavata, costis ad quindecim spinis erectis cavis elongatis pulcherrime ornatis instructa, in interstitiis liris concentricis præcipue umbones versus fortibus cancellata. Auriculæ valde inæquales, anticæ fere obsoletæ. Area dorsalis angusta, parva, excavata. Pagina interna nitida, radiatim sulcata.

Length 9 mm., height 10, diameter $4\frac{1}{2}$.

Habitat.—Tahiti, in 30 to 40 fathoms.

This charming little shell differs from *Lima squamosa* in its shorter and squarer form, fewer ribs, more erect and longer spines, and the coarser liræ between the costæ, especially near the umbones, where they give quite a cancellated appearance to the valves. The anterior slope is a little concave, and ornamented with a few minutely prickled liræ.

Lima angulata, Sowerby.

Lima angulata, Sowerby, Thesaurus, vol. i. p. 86, pl. xxii. figs. 39, 40.
Lima angulata, Sowerby, Conch. Icon., vol. xviii. pl. iii. fig. 13.
Lima basilanica, Adams and Reeve, Voy. "Samarang," p. 75, pl. xxi. fig. 6.
Lima orientalis, Adams and Reeve, *op. cit.*, p. 75, pl. xxi. fig. 7.
Radula (*Mantellum*) *angulata*, Angas, Proc. Zool. Soc. Lond., 1865, p. 656.
Radula (*Mantellum*) *orientalis*, Angas, *op. cit.*, 1871, p. 401.

Habitat.—Port Jackson, New South Wales, in 2 to 7 fathoms (Challenger); Panama and Bay of Carracas, in 10 to 12 fathoms (Sowerby); Philippine Islands (Adams and Reeve); Port Lincoln (Angas).

I do not see any sufficient reasons for separating the above-named forms, and I believe that the *Lima fasciata* of Sowerby (*nec* Linn.) is probably also merely a large and rather coarsely sculptured variety of this species. The outline is very like in all of them.

Lima goliath, Sowerby.

Lima goliath, Sowerby, Proc. Zool. Soc. Lond., 1883, p. 30, pl. vii. fig. 3.
Lima excavata, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 564.

Habitat.— Station 236, off south of Japan, in 775 fathoms; and Station 311, off the west coast of Southern Patagonia, in 245 fathoms.

A single crushed specimen, about 2 inches in length, from the former locality, and a rather smaller odd valve from the latter, are all that were obtained. Whether this species be really distinct or not from the Norwegian *Lima excavata* of Fabricius I cannot decide, but Mr. Sowerby, who has a very accurate appreciation of differences, is of opinion that it is different. The Challenger valves are almost smooth down the middle, and the lateral striæ are finely punctate, whilst Norwegian examples are striated at the centre, and the lateral sulci are not punctured in the same manner.

It is very curious that Japan and South Patagonia should furnish apparently the same species.

Lima (*Ctenoides*) *tenera*, Chemnitz.

Lima tenera, Chemnitz, Conch.-Cab., vol. vii. p. 354, pl. lxviii. fig. 653.
Lima tenera, Sowerby, Thes. Conch., vol. i. pl. xxi. figs. 2, 3, 10, 11.
Lima tenera, Sowerby, Conch. Icon., vol. xviii. pl. ii. fig. 7.
Lima tenera, Hanley, Cat. Recent Shells, p. 266.
Lima (*Ctenoides*) *tenera*, Martens, Moll. Maskaren. p. 315.

Habitat.— Levuka, Fiji Islands, in 12 fathoms (Challenger).

This species is very like the West Indian *Lima scabra*, but is more finely sculptured. Both are equally variable in form. In the British Museum there are specimens from the Island of Narai, Fijis, collected at low water by Macgillivray, from Sir C. Hardy's Island (Jukes), and from Port Essington. Other localities are Zanzibar (Mus. Cuming): Bourbon, Réunion, and Mauritius (Martens): Philippine Islands and Singapore (Sowerby).

Lima (*Mantellum*) *hians*, Gmelin.

Lima hians, Gmelin, Syst. Nat., p. 3332.
Lima hians, Forbes and Hanley, Brit. Moll., vol. ii. p. 268, pl. lii. figs. 3–5.
Lima hians, Jeffreys, Brit. Conch., vol. ii. p. 87, vol. v. p. 170, pl. xxv. fig. 5.
Lima hians, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 564.

Habitat.—Station 36, off Bermuda, in 30 fathoms; coral.

The recent and fossil distribution of this species has been given by Jeffreys, but he has not recorded it from the West Atlantic region.

Lima (*Mantellum*) *loscombii*, Sowerby.

Lima loscombii, Sowerby, Genera Rec. and Fos. Shells, fig. 1.
Lima loscombii, Forbes and Hanley, Brit. Moll., vol. ii. p. 265, pl. lvi. figs. 1–3.
Lima loscombii, Jeffreys, Brit. Conch., vol. ii. p. 85, vol. v. pl. xxv. fig. 1.
Lima loscombii, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 564.

Habitat.—Station 75, off the Azores, in 450 fathoms, and off Nightingale Island, Tristan da Cunha, in 100 to 150 fathoms.

The distribution of this species, both recent and fossil, has already been given by Jeffreys, Weinkauff, and others, but it has not, I believe, been previously recorded from so southern a locality as Tristan da Cunha.

Lima (*Limatula*) *torresiana*, n. sp. (Pl. XXIV. figs. 5–5*a*).

Testa perconvexa, æquilateralis, subovata, solidiuscula, costis radiantibus subnodulosis 22–24 lirisque tenuibus confertis concentricis cancellata. Interstitia subprofunda, costis angustiora, in medio lira filiforme sæpe bipartita. Umbones prominentes, involuti. Area cardinalis elliptica, fossa ligamenti profunda sculpta. Pagina interna radiatim sulcata, margine externo fortiter dentato circumdata.

This is a rather solid species, equilateral, very convex, somewhat ovate, and sculptured with about twenty-four radiating riblets, which are prettily nodulose, the nodules being compressed and very close together. The intervening sulci are somewhat narrower than the costæ, frequently have a very slender thread-like lira up the middle, and are crossed by fine, closely packed, concentric lirae, which connect the nodules on the ribs, or in other words they are continuous and somewhat thickened on crossing the ribs. The umbones are fairly prominent, and well incurved at the tip. The hinge-area is of an elongate elliptical form, and exhibits a rather sunken central diamond-shaped ligament-pit. The interior is regularly grooved, the sulci corresponding to the external costæ, and the outer margin is coarsely and bluntly dentate.

Length 8 mm., height 10, diameter 7½.

Habitat.—Station 186, off Cape York, in 8 fathoms: coral mud.

This is a shorter and much more strongly sculptured shell than *Lima bullata*. It also closely approaches *Lima japonica*, (A. Adams) Sowerby, but not the *Lima japonica* of Dunker, which is a very different species, and may hereafter be called *Lima dunkeri*, as Sowerby's shell has priority of publication.

Lima (*Limatula*) *pygmæa*, Philippi.

Lima pygmæa, Philippi, Wiegmann's Archiv f. Naturgesch., 1845, p. 56.
Limatula falklandica, A. Adams, Proc. Zool. Soc. Lond., 1863, p. 509.
Radula (*Limatula*) *pygmæa*, Smith, Phil. Trans. Roy. Soc., 1879, vol. clxviii. p. 191.

Habitat.—Royal Sound and Balfour Bay, Kerguelen Island, in 28 to 60 fathoms: also Prince Edward and Marion Islands, in 50 to 150 fathoms.

This species also occurs in the South Patagonian region.

Lima (*Limatula*) *bullata* (Born).

Ostrea bullata, Born, Mus. Cæs. Vindobon, p. 110, pl. vi. fig. 8.
Pecten bullatus, Chemnitz, Conch.-Cab., vol. vii. pp. 267 and 348, pl. lxviii. fig. 649*b*.
Ostrea inflata, Gmelin, Syst. Nat., p. 3321.
Lima bullata, Sowerby, Thes. Conch., vol. i. p. 84, pl. xx. figs. 32, 33.
Lima bullata, Sowerby, Conch. Icon., vol. xviii. pl. i. figs. 3, *a*, *b*.
Lima strangei (A. Adams MSS.), Sowerby, Conch. Icon., pl. iii. fig. 15.

Habitat.—Port Jackson, New South Wales, in 2 to 10 fathoms; and Station 162, off East Monœur Island, Bass Strait, in 38 fathoms (Challenger); Port Stephens (Jukes, in Brit. Mus.); Moreton Bay (Mus. Cuming); Sorsogon, Philippines (Sowerby).

This species varies considerably in shape, some specimens being narrower than others. I do not see any sufficient reason for separating the form named *Lima strangei*, the slight obliquity noticed by Sowerby being unimportant.

Lima (*Limatula*) *subovata*, Jeffreys.

Lima subovata, Jeffreys, Ann. and Mag. Nat. Hist., 1876, vol. xviii. p. 427.
Lima subovata, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 563, pl. xlv. fig. 2.

Habitat.—Station 78, off the Azores, in 1000 fathoms.

For the distribution of this species see the above papers, in which the Challenger specimens have already been referred to.

Lima (*Limatula*) *confusa*, n. sp. (Pl. XXIV. figs. 6–6*a*).

Lima ovata, Jeffreys (*nec* Searles Wood), Ann. and Mag. Nat. Hist., 1876, vol. xviii. p. 426.

Testa parva, tenuis, ovata, convexa, nitida, subpellucida, liris gracillimis radiantibus ad 29 instructa, striisque incrementi tenuissimis sculpta. Margines laterales per lirarum extremitates leviter serrati. Umbones prominentes, paulo incurvati.

Length $2\frac{1}{2}$ mm., height $3\frac{2}{3}$, diameter $2\frac{1}{2}$.

Habitat.—Station 78, off the Azores, in 1000 fathoms; Station 120, off Pernambuco, Brazil, in 675 fathoms; and Station 23, off Sombrero Island, West Indies, in 450 fathoms (Challenger); North Atlantic (Station 12), in 1450 fathoms ("Valorous").

I cannot agree with the late Dr. Gwyn Jeffreys in considering this species the same as the Crag fossil *Lima ovata* of Searles Wood. That is a differently shaped shell, more strongly ribbed down the middle of the valves, entirely or almost wholly destitute of liræ at the sides where the margins are even and not serrate, and strongly dentate within the ventral outline. Jeffreys gives the number of ribs at "about 50." Should this be 30? For in two valves received by the British Museum from him from the "Valorous" expedition I find that number.

Lima (*Limatula*) sp.

Habitat.—Station 104, Mid Atlantic, south-west of Sierra Leone, in 2500 fathoms.

A single specimen, which is too damaged for description, apparently belongs to a new species. It is of small size (5 mm. high), of an elongate, narrow form, excessively thin, glossy, and sculptured with numerous very fine hair-like radiating liræ, which produce dentate margins to the valves, and rather conspicuous lines of growth, giving the surface a more or less cancellated appearance.

Lima (*Limatula*) sp.

Habitat.—Station 317, north of the Falkland Islands, in 1035 fathoms.

The single shell obtained at this Station may be a more mature example of the species from Station 104. It is thicker in texture, more strongly lirate, and not so pointed beneath. It also closely approaches *Lima subovata*, but is ornamented with a coarser cancellation, has less prominent umbones, and is more rounded at the ventral margin.

Lima (*Limatula*) sp.

Habitat.—Off Nightingale Island, Tristan da Cunha, in 100 to 150 fathoms.

A single minute valve from this locality approaches very closely *Lima subovata*, but may be distinct. It is not quite so convex, not so pointed beneath, and has rather fewer radiating liræ. The interior exhibits three thread-like liræ down the centre, with grooves between them which terminate on the margin in little denticles. It may be the young state of the species from Station 317.

Lima (*Limatula*) *laminifera*, n. sp. (Pl. XXIV. figs. 7–7*a*).

Testa parva, tenuis, pellucida, ovata, superne truncata, æquilateralis, mediocriter convexa, laminis concentricis tenuibus numerosis, lirisque paucis obsoletis prope medium instructa. Linea cardinalis gracilis, lævis. Area ligamenti angusta, fossa

mediana lata sculpta. Umbones centrales, ad apicem lævigatum haud acuti, supra marginem dorsalem vix producti. Pagina interna nitida, sculpturam externam exhibens.

Length 2 mm., height 3¼, diameter 1½.

Habitat.—Station 23, off Sombrero Island, West Indies, in 450 fathoms; Station 24, off Culebra Island, in 390 fathoms.

This interesting little species is readily recognisable by the almost total absence of radiating sculpture, and the very slender concentric lamellæ. The radiating liræ which do exist are very faint, and occur only down the central portion of the valves, giving the laminæ a somewhat frilled appearance. The auricles are equal and scarcely defined, the lateral margins of the valves being regular and faintly curved at the upper part, and not constricted.

Lima sarsii is more distinctly radiately ribbed, is said to have the hinge-plate "bluntly but distinctly crenulated across," and the front margin "strongly crenate and notched within," features not occurring in the present species.

Family Pectinidæ.

Pecten, Müller.

Pecten asperrimus, Lamarck.

Pecten asperrimus, Lamarck, Anim. sans vert., ed. 2, vol. vii. p. 145.
Pecten asperrimus, Reeve, Conch. Icon., vol. viii. pl. xx. fig. 75.
Pecten asperrimus, Sowerby, Thes. Conch., vol. i. p. 75, pl. xvii. fig. 156 (157 and 158).
Juv. = *Pecten australis*, Sowerby (*non* Philippi), *op. cit.*, p. 76, pl. xix. figs. 219, 220.
Pecten australis, Reeve, *loc. cit.*, pl. xxv. figs. 103, *a*, *b*.

Habitat.—Station 162, off East Monœur Island, Bass Strait, in 38 fathoms.

In the young state the rays of this species consist of a central ridge and two finer liræ, one on each side, all very finely squamate as in *Pecten australis*. At maturity the liræ usually number three on each side. The closely allied *Pecten prunum*, Reeve, has a broader central ridge to the rays, which in consequence look rounder, and the auricles are larger. Like many other Pectens, this is also variable in colour, in some instances being of a plum colour, in others orange or scarlet. The Challenger specimens are uniformly reddish-orange.

Pecten patagonicus, King.

Pecten patagonicus, King, Zool. Journ., vol. v. p. 337.
Pecten patagonicus, Sowerby, Thes. Conch., vol. i. p. 54, pl. xiii. fig. 16.
Pecten patagonicus, Reeve, Conch. Icon., vol. viii. pl. xxvi. fig. 110.
Pecten patagonicus, Smith, Proc. Zool. Soc. Lond., 1881, p. 44.
Juv. = *Pecten radiatulus*, Reeve, *op. cit.*, pl. xxxii. fig. 147.
? = *Pecten australis*, Philippi, Wiegmann's Archiv f. Naturgesch., 1845, p. 56.

Habitat.—Station 312, South Patagonia, in 9 fathoms; and Station 315, Falkland Islands, in 12 fathoms.

The right valve of this species is usually white or only partly tinted with purplish-red, and contrasts strongly with the red-rayed left valve. The specimen figured by Reeve is rather abnormal in colour, as the ribs in most specimens are not alternately dark and pale.

Pecten pusio (Linné).

Ostrea pusio, Linné, Syst. Nat., ed. 12, p. 1146.
Pecten pusio, Forbes and Hanley, Brit. Moll., vol. ii. p. 278, pl. l. figs. 4, 5, pl. li. fig. 7.
Pecten pusio, Jeffreys, Brit. Conch., vol. ii. p. 51.
Pecten pusio, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 557

Habitat.—Tenerife, Canary Islands, in 70 fathoms; and Station 75, Azores, in 450 fathoms.

In this, as in other instances, I refrain from giving the copious synonymy and references to a great number of works, a course only excusable in preparing a monograph.

Pecten sulcatus, Müller, var.

Pecten sulcatus, Müller, 1776, Zool. Dan. Prodrom., p. 248, No. 2995.
Pecten sulcatus, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 557.
Ostrea arata, Gmelin, Syst. Nat., p. 3327, No. 60.
Pecten aratus, Sars, Moll. Reg. Arct. Norv., p. 17, pl. ii. figs. 3*a*–3*b*.
Pecten idæus, Reeve, Conch. Icon., vol. viii. pl. xxxiii. fig. 153.

Habitat.—Station II., off the coast of Portugal, in 470 fathoms; green mud.

The only specimen from this Station agrees with the variety *crebricostata* of Sars, in which the riblets are very numerous and similar in both valves. The distribution of this species, recent and fossil, having already been given by Jeffreys, I have merely to call attention to the identity of *Pecten idæus*, Reeve, a fact hitherto unnoticed.

Pecten gibbus (Linné).

Ostrea gibba, Linné, Syst. Nat., p. 1147.
Pecten gibbus, Lamarck, Anim. sans vert., ed. 2, vol. vii. p. 152.
Pecten gibbus, Sowerby, Thes. Conch., vol. i. p. 52, pl. xii. figs. 1, 2, and pl. xiv. fig. 72.
Pecten gibbus, Reeve, Conch. Icon., vol. viii. pl. ix. fig. 37, *a*–*c*.

Habitat.—Station 75, off the Azores, in 450 fathoms; volcanic mud.

Only one or two very small valves of this species were obtained. It is said to occur on the west coast of Africa, and at the West Indies.

Pecten noronhensis, n. sp. (Pl. XXI. figs. 4–4*b*).

Testa paulo inæquivalvis, convexa, inæquilateralis, alba, aurantio vel saturato-roseo maculata, costis ad 17 valde prominentibus instructa; costæ valvæ dextræ interstitiis profundis pulcherrime transversim lamellatis latiores, lævigatæ; valva sinistra costis paulo gracilioribus, interstitia æquantibus, lira mediana tenui bipartitis instructa, undique et supra et inter costas tenuissime lamellata. Auriculæ inæquales, radiatim tenuiter costulatæ. Pagina interna purpurascens, albo limbata, vel omnino alba.

This species is somewhat inequivalve, the right valve being a trifle deeper than the left. It is rather convex, and inequilateral, and has an apparent obliquity, owing to the hinder slope from the umbones being longer than the anterior. It is white, and more or less copiously blotched with orange or deep rose. The valves are differently sculptured. The right has the ribs (about seventeen in number) smooth above, and broader than the deep intervening sulci, which are most beautifully ornamented with close and excessively delicate concentric lamellæ. In the left valve the ribs about equal the furrows in width, are divided into two parts by a fine central lira, and are crossed by the very delicate lamellæ which also occur in the sulci. The ears are unequal. In the left valve both are concave at the sides, especially the front one, which is the smaller. In the right valve the posterior is incurved laterally, and the anterior is deeply cut in underneath and ornamented with about five squamate ridges. The interior of the largest specimens is purple, with the exception of a narrow white border, but smaller specimens are entirely colourless within.

Length 27 mm., height 26, diameter 12.

Habitat.—Station 113A, off Fernando Noronha, in 25 fathoms; volcanic sand and gravel.

This species is considerably like *Pecten gibbus*, Linn., but may be recognised by the following differences. Judging from the few specimens at hand, it appears to be rather more convex, more inequilateral, the ribs are stouter, fewer, more elevated and sharply cut, and differently sculptured, and the posterior auricles are less oblique at the side and more concave.

Pecten philippii, Récluz.

Pecten philippii, Récluz, Journ. de Conch., 1854, vol. iv. p. 52, pl. ii. figs. 15, 16.
Pecten philippii, Petit. Cat. Moll. Test. Europe, pp. 79, 200.
Pecten philippii, Hidalgo, Moluscos Marin. Espana, pl. xxxii. fig. 2.
Pecten philippii, Weinkauff, Conchyl. Mittelm., vol. i. pp. 251, 300.
Pecten commutatus, Monterosato, Poche Note Conch. Medit., 1875, p. 6.

Habitat.—Station 75, off the Azores, in 450 fathoms; volcanic mud.

This species appears to be distributed in some western parts of the Mediterranean, on the coasts of Spain and Portugal, and at the Canary Islands, which is the most southern locality at present known.

Monterosato changed the name of this species to *Pecten commutatus*, because Michelotti had, previously to Réclnz, designated a fossil form by the name *Pecten philippii*. As that species belongs to *Amussium*, a genus which is nowadays usually recognised, it seems a pity to abolish the name by which the present species is so well known.

Pecten limatula, Reeve, var. (Pl. XXI. figs. 5–5*a*).

Pecten limatula, Reeve, Conch. Icon., vol. viii. pl. xxviii. fig. 124.

Testa tenuis, paulo inæquilateralis, interdum obliqua, fere æquivalvis, mediocriter convexa, pallida, radiis paucis zonisque concentricis dilutissime subroseis picta, superne utrinque umbones rosco tincta. Valvæ striis tenuissimis concentricis umbones versus præcipue conspicuis ornatæ, costulisque gracilibus circa quinquagenis minute squamulatis instructæ. Auriculæ valde inæquales (posticis majoribus radiatim costulatis, anticis brevibus ad latera oblique truncatis). Postica valvæ sinistræ inferne profunde sinuata, ad extremitatem subtruncata. Umbones acuti, parvi, sublævigati, marginibus lateralibus concavis, postico in valva sinistra denticulato. Pagina interna nitens, radiatim sulcata.

This is a thin, delicate shell, rather higher than long, of a somewhat oblique growth, and consequently a little inequilateral. It is of a pale colour, but, being faintly rayed and concentrically zoned with a very light rosy tint, has a general appearance of being of that colour which is heightened into a decided rose tint on both sides of the beaks.

The valves are only moderately convex, about equally deep, ornamented with about fifty radiating riblets bearing innumerable minute erect scales. Some of the riblets do not extend as far as the umbones, and being situated close to others, impart to them the appearance of being in pairs. Between the costellæ the surface is adorned with excessively fine concentric striæ, which, however, towards the umbones, are replaced by more distinct elevated lamellæ, which do not, however, cross the ridges, which at this part are entirely destitute of scales. The beaks are rather acute, and somewhat glossy near the tip, which consists of a very minute convex vitreous boss. The converging sides, of which the posterior is armed with many minute compressed denticles, are rather concave, unequal in length, the anterior being somewhat the longer, and form in the two largest specimens an apical angle of about 100° and in some instances scarcely 90°.

The ears are very unequal. The anterior are short, obliquely truncate at the sides, and radiately ribbed, the ribs being about seven in number, slightly squamous and very slender, with the exception of the upper marginal one, which is usually much stronger

than the rest. The posterior auricle of the right valve is large, and has about ten fine riblets, that of the left valve is deeply situated below, truncated at the end, and sculptured with fine ridges (the marginal one being the largest) covered with closely packed transverse squamulæ. The portion of the sinus filled up during the growth of the shell is white, somewhat concave, and crossed by coarse elevated lines of growth. The inner surface of the valves is glossy, tinted like the exterior, and finely grooved and ridged; or, in other words, exhibits a reversal of the external ornamentation, the grooves corresponding to the ridges of the exterior and the ridges to the intervening sulci.

Length 22½ mm., height 24½, diameter 6½.

Habitat.—Station 141, off the Cape of Good Hope, in 98 fathoms; also Station 135, off Nightingale Island, Tristan da Cunha group, in 100 to 150 fathoms.

In the earliest stage this shell is smooth or only microscopically striated by lines of growth. It then assumes a second style of ornamentation, consisting of fine wavy radiating wrinkles which run in among the incipient costæ. To this wrinkling succeeds the fine concentric striæ, which subsequently become more remote and less pronounced.

The Challenger shells above described do not correspond precisely with the single type specimen of this species in the British Museum. This formed part of the Cumingian collection, and, like the majority of Mr. Cuming's specimens, has been spoilt through over-cleaning, nearly all the microscopic sculpture being destroyed. It differs from the shells under examination in having the posterior ear of the left valve slightly larger, and the scales upon the riblets rather fewer. Both valves, but especially the right, have a number of dark and pale brown spots, due probably to living in shallower water than the Challenger specimens.

(?) *Pecten lemniscatus*, Reeve.

Pecten lentiginosus, Reeve, Conch. Icon., vol. viii. pl. xxxv. fig. 170 (*non* species 76).
Pecten lemniscatus, Reeve, *op cit.*, Errata at end of Index.

Habitat.—Samboangan, Philippine Islands, on Reefs, in 10 fathoms.

The single Challenger shell is considerably like the type in the British Museum, but exhibits in the grooves between the ribs a fine shagreen-like sculpture which I do not find in the specimen referred to, the only one I have been able to examine, and which, having been rather over-cleaned, may have lost its more delicate ornamentation. Reeve's description of the right valve is not altogether clear. He says it is "ecostata, undique lirata, squamis brevibus abrupte nodulosis." The ridges are in fact more equal in thickness than in the other valve, of which in size they about equal the smaller ones. They are closely squamate, and the scales being worn off to a great extent have to the naked eye a finely nodulous appearance.

Pecten undulatus, Sowerby.

Pecten undulatus, Sowerby, Thes. Conch., vol. i. p. 60, pl. xix. figs. 206, 207.
Pecten undulatus, Reeve, Conch. Icon., vol. viii. pl. xx. fig. 73.
? = *Pecten tasmanicus*, A. Adams and Angas, Proc. Zool. Soc. Lond., 1863, p. 128, pl. xxxvii. figs. 21, *a*, *b*.

Habitat.—Station 162, off East Moncœur Island, Bass Strait, in 38 fathoms (Challenger); Tasmania (Brit. Mus.).

This species is not the same as *Pecten flexuosus*, Poli, as stated by Weinkauff (Conch. Mittelm., vol. i. p. 258), nor would he have considered it as such had it been properly characterised in the first instance. The minute shagreened sculpture is very peculiar, at once distinguishing it from the European form, and as described by Adams and Angas in respect of *Pecten tasmanicus*, which, I believe, will prove to belong to the same species, it is very like that of *Pecten bifrons*. The auricles are very unequal, notwithstanding the statement of Messrs. Adams and Angas to the contrary, whose figure, moreover, depicts them of different dimensions, but not so unequal as in the types figured by Sowerby and Reeve, and in a single specimen from Tasmania in the British Museum.

The ribs are somewhat variable in number, and the colour of the left valve is rather inconstant. The right valve appears to be always white, or only a little tinted with purple-pink. The interior of the valves in a great measure corresponds in colour with the exterior, the right being purplish-pink and the left chiefly white.

I am not sure that *Pecten tasmanicus* is the same species as *Pecten undulatus*, for the fine riblets, judging from the figure, appear to be coarser; but the locality and microscopic sculpture, being similar, point to the conclusion that they are both forms of one rather variable species.

Pecten leopardus, Reeve (var. *solaris*).

Pecten leopardus, Reeve, Conch. Icon., vol. viii. pl. xxxii. fig. 145.
Pecten leopardus, Smith, Report "Alert" Coll., p. 114.
Var. = *Pecten kuhnholtzi*, Bernardi, Journ. Conch., 1860, vol. viii. p. 378, pl. xiii. fig. 1.
Var. = *Pecten solaris*, Sowerby (*non* Born) Thes. Conch., vol. i. p. 55, pl. xii. figs. 7, 8, 22.
Pecten solaris, Dunker, in Philippi's Abbild., vol. i. p. 202, pl. ii. fig. 2.
Pecten solaris, Reeve, *op. cit.*, pl. xxiii. fig. 92.

Habitat.—Station 208, off the west coast of the Island of Luzon, Philippine Islands, in 18 fathoms; blue mud.

The typical form of this species was collected on the coast of Queensland. The variety *kuhnholtzi* is New Caledonian, and var. *solaris* has been found at Amboina

(Dunker), Macassar and China (Reeve). In the "Alert" Report I forgot to mention that in addition to the difference of colouring the typical form also presents a difference in outline. The auricles are certainly larger than in either of the varieties, and the sides are more spreading or fan-like. This variation, however, is approached by one of the specimens of var. *kuuholtzi* in the British Museum, and I have little doubt that had I a large series for examination I should find many intermediate forms, and should also probably observe that each variety as a rule maintains its special shape.

Pecten senatorius (Gmelin), var.

Ostrea senatoria, Gmelin, Syst. Nat., p. 3327.
Pecten senatorius, Sowerby, Thes. Conch., vol. i. p. 74, pl. xvii. fig. 151, and pl. xviii. figs. 188–192.
Pecten senatorius, Reeve, Conch. Icon., vol. viii. pl. xxi. fig. 81.

Habitat.—Stations 203 and 208, Philippine Islands, in 20 and 18 fathoms.

The single specimen from Station 208 and two from 203 differ from each other in colour and also somewhat in sculpture. Both forms are also very unlike the *Pecten senatorius*, as figured in Reeve's work as regards colour, but after careful consideration and comparison I do not think it advisable to separate them. The former specimen has more the general appearance of *Pecten lagardi*, Reeve, the other two more resembling *Pecten rugosus* of Sowerby. There is a large group of species which requires careful investigation, and which probably could be considerably reduced in number. It comprises *Pecten senatorius*, *Pecten cruentatus*, Reeve, *Pecten gloriosus*, Reeve, *Pecten crassicostatus*, Sowerby, *Pecten nobilis*, Reeve, *Pecten lagardi*, Reeve, *Pecten cristularis*, Adams and Reeve, *Pecten rugosus*, Sowerby, *Pecten triradiatus*, Reeve, *Pecten testudineus*, Reeve, *Pecten cloueti*, Reeve, *Pecten miniaceus*, (Lamk.) Sowerby, *Pecten pseudolima*, Sowerby, *Pecten blandus*, Reeve, *Pecten fricatus*, Reeve, *Pecten reticulatus*, Reeve, and *Pecten suniosus*, Reeve. The small forms may possibly be but young shells of the larger ones, for we do not know the limits in size of many of the exotic species.

Pecten corallinoides, d'Orbigny.

Pecten corallinoides, d'Orbigny, in Webb and Berthelot's Hist. Nat. Canaries, vol. ii. pt. 3. p. 102, pl. vii. figs. 20–22.
Pecten corallinoides, Sowerby, Thes. Conch., vol. ii. p. 65, pl. xii. figs. 3, 4.

Habitat.—St. Vincent, Cape Verde Islands, in 7 to 20 fathoms; and Tenerife, in 70 fathoms (Challenger); Canary Islands (d'Orbigny).

The shells of this species, of *Pecten nodulíferus*, Sowerby, and *Pecten nodosus*, Linn., are very much alike, and, what would not be expected, a greater similarity exists

between the two first, which are found on opposite sides of Africa, than between the first and last, inhabitants of different parts of the same ocean.

Pecten amicus, n. sp. (Pl. XXI. fig. 6).

Testa compressa, aurantiaco-rufescens, umbones versus albida, costis octo latis rotundatis, liris pluribus tenuibus squamulatis ornatis, instructa; interstitia profunda, angusta, minute et pulcherrime reticulata. Auricula postica valvæ dextræ minima, antica mediocriter magna, inferne haud profunde sinuata, antice oblique curvata, liris radiantibus tenuibus circiter sex, incrementique lineis sculpta.

Only a single valve of this species, and that evidently immature, is at present known. The sculpture being so remarkable, I do not hesitate to describe it as new.

It is narrow, compressed, slightly unequal sided, the posterior slope being a little longer than the anterior, and like it nearly rectilinear, together forming an apical angle of about seventy degrees. It is of an orange-reddish tint, gradually paler towards the umbones, and has eight broad rounded ribs which are moderately elevated, and ornamented with several very slender prickly-scaled lirae. The grooves between the ribs are narrow, deepish, and ornamented with an excessively fine regular square-meshed network. The auricles are very unequal, the posterior being very small indeed, whilst the anterior (in the right valve) is fairly large, obliquely curved in front, not deeply sinuate beneath, and bears about six fine radiating lirae, which are crossed by the lines of increase. The interior exhibits more or less of the external tinting, which, however, in a more mature shell, would probably be less vivid.

Length 12 mm., height 14½, probable diameter of the perfect specimen 4.

Habitat.—Station 172, off Nukalofa, Tongatabu, in 18 fathoms.

Pecten tigris and *Pecten pes-felis* are rather like this species in general appearance, but differ in the detail of the sculpture, both of them being finely lirate in the sulci between the ridges and sculptured with a different microscopic ornamentation.

Pecten testæ, Bivona.

> *Pecten testæ*, Bivona, Philippi, Enum. Moll. Sicil., vol. i. p. 81, pl. v. fig. 17, vol. ii. p. 57.
> *Pecten striatus*, var. *furtivus*, Forbes and Hanley, Brit. Moll., vol. iv. pl. li. fig. 2.

Habitat.—Station 75, off Fayal, Azores, in 450 fathoms: volcanic mud.

Only a single valve was obtained of this species, which has not, I believe, been recorded from so southern a locality. It exactly agrees with Mediterranean specimens with which I have compared it, being quite smooth, with the exception of the microscopic decussation as described by Philippi.

Pecten kermadecensis, n. sp. (Pl. XXI. figs. 7–7*a*).

Testa fragilis, tenuissima, pellucida, valde compressa, valvis diverse sculptis. Valva dextra liris gracillimis confertis concentricis instructa, sinistra liris concentricis magis distantibus radiatimque pulcherrime squamulatis ornata. Auriculæ inæquales, anticis majoribus, in valva dextra antica inferne sinuata, porca angusta marginata, superne cristulata. Umbones mediocriter acuti, lateribus divergentibus rectis.

Only two valves described above were obtained, and it is even possible that they do not both belong to one and the same species. They are about as long as high, very thin and fragile, transparent whitish, very much flattened, and ornamented with different sculpture. The right has fine close-set concentric liræ, which become a trifle more pronounced as the shell increases. The left also bears numerous rather more remote and more elevated concentric liræ, supporting many radiating series of small scales, of which one or two indications are visible in the right valve. The ears are unequal, the anterior being conspicuously larger than the posterior. The front one in the right valve is sinuated beneath, and is margined along the oblique dorsal slope by a smoothish ridge, which is concave on the reverse side. The lines of growth are conspicuous on the ears, and in the right valve are produced upward, forming a crested edge to the hinge-line. The beaks are moderately acute, having an apical angle of about 108°, the converging lines being rectilinear.

Length 7½ mm., height 7½, diameter 2½.

Habitat.—Station 171, north of Kermadec Islands, at a depth of 600 fathoms.

This is a fragile species, and probably, living at such a depth, never becomes much thickened.

Pecten pudicus, n. sp. (Pl. XXI. figs. 8–8*b*).

Testa tenuissima, planulata, paulo inæquivalvis, albida, haud nitida, concentrice valde plicata, plicis utrinque attenuatis, undique confertim et tenuiter lirata. Auriculæ inæquales, anticis majoribus, antica valvæ dextræ liris gracilibus paucis squamulatis ornata, inferne profunde sinuata.

Length 18½ mm., height 20, diameter 5.

Habitat.—Station 146, east of Marion Island, in 1375 fathoms; Globigerina ooze.

This beautiful species is very like *Pecten fragilis* of Jeffreys, but appears to differ somewhat in form and in having both valves similarly plicate and lirate. The auricles also are not "equal in size," the anterior being decidedly larger than the posterior.

The right valve is rather flatter than the left, and its anterior auricle is deeply incised underneath, the upper half of it being ornamented with four or five finely squamate slender liræ.

Pecten murrayi, n. sp. (Pl. XXII. figs. 1 1*a*).

Testa irregulariter circularis, compressa, tenuissima, subhyalina, inæquivalvis, sordide albida. Valva dextra fere plana, incrementi lineis tenuibus striata, sinistra paulo convexa, liris numerosis regularibus concentricis tenuissimis instructa. Auriculæ valvæ sinistræ fere æquales, postica latere posteriori continua; antica valvæ dextræ parva, inferne mediocriter profunde sinuata, sinu callo tenui induto. Pagina interna nitida.

Length 15½ mm., height 14½, diameter 2.

Habitat.—Station 184, east of Cape York, North Australia, in 1400 fathoms.

In this very flat species the hinge-line occupies about two-fifths of the whole length of the shell. The valves are differently sculptured, the concentric liræ of the deeper or left one being stronger than those in the right. In this, in addition to the concentric sculpture, minute interrupted lines which radiate from the apex are discernible under the microscope, and within it is slightly nacreous.

Pecten vitreus (Chemnitz).

Pallium vitreum, var. *papyraceum*, Chemnitz, Conch.-Cab., vol. vii. pp. 267, 335, pl. lxvii fig. 637*a*.
Pallium vitreum, Schröter, *op. cit.*, Index, p. 78.
Pecten vitreus, Philippi, Abhandl., vol. i. p. 203, pl. ii. fig. 3.
Pecten vitreus, Jeffreys, Brit. Conch., vol. v. p. 168, pl. xcix. fig. 6.
Pecten vitreus, Sars, Moll. Reg. Arct. Norv., p. 21, pl. ii. figs. 5*a*, 5*b*.

Habitat.—Stations 307, 308, 310, and 311, all off the west side of Southern Patagonia, in 140 to 400 fathoms; Station 232, South Japan, in 345 fathoms; and Stations 204, 207, and 209, all off the Philippine Islands, in 100 to 700 fathoms.

The specimens from Stations 307 to 311 have already been associated with this species by Jeffreys, and although I have only had an opportunity of comparing them with two northern examples, there seems also, judging by the descriptions and figures, no reason for questioning the identification. The mantle is finely papillose, and furnished with minute black-ringed ocelli. *Pecten fragilis*, an allied form, is said by Friele to be devoid of this characteristic.

These Patagonian specimens appear to be quite typical examples of the species. Having the same form and the surface covered more or less with the interrupted rows of scales. The single example from South Japan has very little of this squamate character, being only about half-grown, but in form and the microscopic sculpture agrees perfectly with the normal type of the species. *Pecten vitreus*, King (Zool. Journ., vol. v.), from Patagonia, is a totally different shell.

The shells from the Philippine Islands have very numerous rows of scales which are rather longer than in other specimens of this species which I have examined.

With this exception, and a very slight variation in the microscopic sculpture, there do not at present appear to be any further or sufficient grounds for specifically separating the Philippine examples. If we had a more extended series of specimens for examination, it is possible further differences would present themselves.

Pecten subhyalinus, n. sp. (Pl. XXII. figs. 2–2*a*).

Testa compressa, tenuissima, vitrea, nitida, aliquanto inæquivalvis; valva sinistra paulo convexior, fere lævis, striis paucis concentricis aliisque radiantibus sculpta; valva dextra striis concentricis regularibus ornata. Auriculæ inæquales, bene definitæ, anticis paulo majoribus, illa valvæ dextræ radiatim lirata, mediocriter profunde sinuata. Margo valvæ infra sinum rectilinearis, haud denticulatus.

Length 7 mm., height $7\frac{1}{2}$, diameter 2.

Habitat.—Station 310, off the west coast of Southern Patagonia, in 400 fathoms.

This species belongs to the same group as *Pecten vitreus* (Chemnitz), from which it differs both in sculpture and form. In that species the posterior auricles are scarcely defined, whilst in the present form there is a well marked umbonal rectilinear ridge, from the apex to the side margin. The anterior umbonal slope in that species is incurved and toothed, in this it is straight and edentulous.

Pecten distinctus, n. sp. (Pl. XXII. figs. 3–3*a*).

Testa parva, compressa, paulo inæquivalvis, tenuis, subpellucida, haud nitida, sordide albida. Valva dextra parum convexa, concentrice tenuissime lamellato-striata, sinistra paulo convexior, liris concentricis fortioribus instructa, liris radiantibus paucis indistinctis ornata. Auriculæ inæquales, definitæ, anticis majoribus, illa valvæ dextræ radiatim lirata, inferne haud profunde sinuata.

This little species is slightly inequivalve, the left valve being rather deeper than the other. It is compressed, thin, a little transparent, not glossy, of a dirty white colour, and has differently sculptured valves. The right has much finer concentric liræ than the left, and has no radiating lines, which, however, are not particularly conspicuous in the other valve. The umbones are rather acute, the straight or feebly incurved sides forming an apical angle of about 105°. The ears are unequal, the front ones being the larger. That in the right valve is ornamented with six or seven fine liræ, which cover the greater part of the surface, leaving only a narrow plain groove at the moderately deep sinus.

Length 8 mm., height $7\frac{1}{2}$, diameter 2.

Habitat.—Off Marion Island, in 100 fathoms.

In this species the ears are depressed and well marked off from the rest of the surface.

Pecten clathratus, Martens (Pl. XXII. figs. 4–4*a*).

Pecten clathratus, Martens, Sitzungsb. d. Gesellsch. naturf. Freunde, Berlin, 1881, p. 79.

Testa tenuis, subpellucida, inæquivalvis; valva dextra planiuscula, parum nitida, incrementi lineis striata, striisque microscopicis radiantibus, undique subcancellata; valva sinistra profundior, lamellis concentricis, tenuibus, lirisque numerosis radiantibus filiformibus cancellata. Auriculæ fere æquales, antica valvæ dextræ lamellis incrementi sculpta, ad extremitatem rotundata, inferne profunde sinuata.

This species is considerably inequivalve, thin, rather pellucid and compressed. The right valve is only a little convex, and, as it were, fits within the other valve, although in reality its outer margin, which is upturned, does extend to the edge of the left valve. It is a little glossy, sculptured with very fine lines of growth, and has a microscopic, subgranular, radiating structure. The left valve is much deeper and ornamented with stronger sculpture, consisting of very fine concentric lamellæ and still finer and more numerous radiating ones, together producing a pretty cancellated appearance. The ears are not very unequal, the anterior being only a little larger than the posterior. The front one in the right valve is broadly curved at the end, rather deeply cut in underneath, and sculptured with strongish lines of growth. The umbones are acute, the sides forming an apical angle of about 100 degrees.

Length $3\frac{1}{2}$ mm., height $3\frac{1}{3}$, diameter 1.

Habitat.—Off Christmas Harbour, Kerguelen Island, in 120 fathoms.

The shells obtained at this locality apparently belong to the *Pecten clathratus* of von Martens, but as I am not absolutely certain I have deemed it advisable to give the above description.

Pecten aviculoides, n. sp. (Pl. XXII. figs. 5–5*a*).

Testa parva, valde inæquivalvis, paulo obliqua, tenuis, sordide albida. Valva dextra planiuscula, nitida, striis incrementi tenuissimis sculpta, sculptura microscopica subreticulata ornata. Valva sinistra profunda, lamellis concentricis, validis, costisque ad octo radiantibus fortiter cancellata. Auriculæ subæquales, auricula valvæ dextræ antica lamellis incrementi lirisque paucis radiantibus instructa, inferne subprofunde sinuata. Linea cardinis longa, longitudinem totam testæ æquans. Umbones centrales, ille valvæ sinistræ paulo supra marginem productus.

This species is remarkable for the great difference in the sculpture of the valves. It is rather like a minute *Avicula* in form, slightly oblique in growth, very inequivalve, thin, and of a dirty white colour. The right valve is very slightly convex at the centre,

and fits, as it were, within the other valve, its very thin margin being upcurved and appressed to the outer edge of the other valve. It is sculptured with a few lines of growth, and has under the microscope a minutely shagreened appearance. The left valve is much deeper, and ornamented with coarse concentric lamellæ, which, crossing about seven or eight strongish radiating liræ, produce a coarsely cancellated surface. The ears in this valve have only the concentric lamellæ and are about equal in size, the posterior being situated at the side. The anterior auricle in the right valve is ornamented with concentric lamellæ of growth which cross a few radiating ridges, and it is rather deeply cut in beneath. The hinge-line occupies the whole length of the shell, and above the centre the umbo of the left valve is slightly prominent.

Length 2 mm., height $1\frac{3}{4}$, diameter $\frac{1}{2}$.

Habitat.—Prince Edward Island, in 100 to 150 fathoms.

The shell here described is probably not adult; but as the sculpture of the valves is so markedly different and not like that of any other species with which I could compare it, I do not think it hazardous to name it.

Pecten culebrensis, n. sp. (Pl. XXII. figs. 6–6*a*).

Testa compressa, paulo inæquivalvis, tenuissima, semipellucida, altior quam longa. Valva dextra parum convexa, lamellis numerosis concentricis, plus minusve radiatim squamulatis, ornata. Valva sinistra leviter convexior, liris tenuibus radiantibus et concentricis confertim cancellata, et nodulosa. Auriculæ inæquales; antica valvæ dextræ superne cristata, radiatim lirata, inferne mediocriter profunde sinuata.

This is a very compressed species, very thin, semitransparent, slightly inequivalve, and higher than long. The right valve is a little flatter than the left, and sculptured with numerous fine concentric lamellæ which are more or less ornamented with small scale-like projections disposed in radiating series. When these are broken off the lamellæ have a frilled appearance. The left valve has a somewhat coarser sculpture, which consists of slightly stronger concentric liræ and numerous radiating ones, some of which, at irregular intervals, are thicker than the rest, the points of intersection of all, but especially the stronger ones, with the concentric liræ being prettily nodulose. The ears are rather unequal, the anterior as usual being the larger. That of the right valve is rather strongly sculptured with lamellæ of growth (produced above into a crest along the hinge-line) and a few somewhat feeble radiating ridges. The umbones are rather acute, having the sides, of which the anterior is rather straighter than the posterior, converging to an apical angle of about 95 degrees.

Length $8\frac{1}{2}$ mm., height $9\frac{1}{3}$, diameter $2\frac{2}{3}$.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

Pecten sp.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

A few odd valves of a thin subpellucid *Pecten* were dredged at this Station which appear to belong to an undescribed species. As they are in rather poor condition, and I am uncertain whether I have correctly paired the valves, or have associated together the right and left valves of two distinct forms, I have refrained from naming them. The right valves are about as convex as the left, and sculptured with very many regular concentric striæ. The left valves to a great extent have the sculpture worn off, but what remains consists of more distant concentric lamellæ and radiating thread-like liræ. The auricles are unequal, the anterior being the larger, and that in the right valve has a radiating ridge or two crossed by the lines of growth. The length is 4 mm. and the height about the same.

Pecten sp.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

A single right valve only was obtained of this species, which I cannot identify with any as yet known. It is quite flat, glossy, irregularly concentrically waved or plicate, and devoid of any sculpture except upon the front auricle, which has the upper half ornamented with four or five finely squamate liræ. It is 9 mm. in length and 10 in height.

Pecten (*Janira*) *fumatus*, Reeve.

Pecten fumatus, Reeve, Conch. Icon., vol. viii. pl. vii. fig. 32.
Vola fumata, Angas, Proc. Zool. Soc. Lond., 1867, p. 933.

Habitat.—Port Jackson, New South Wales, in 2 to 10 and 4 to 18 fathoms.

This species is peculiar for its almost uniform sombre colour. The deep valve is, however, generally somewhat paler towards the umbo, and the flat valve also occasionally exhibits a whitish patch in the same region. The interior is white, especially the convex valve, but stained with burnt brown on the ears and towards the outer margin. The epidermis, principally on the concave valve, is closely concentrically lamellated and somewhat fibrous.

Pecten (*Janira*) *laqueatus*, Sowerby.

Pecten laqueatus, Sowerby, Thes. Conch., vol. i. p. 46, pl. xv. fig. 101
Pecten laqueatus, Reeve, Conch. Icon., vol. viii. pl. xxx. fig. 135.
Pecten laqueatus, Lischke, Japan. Meer.-Conch., Theil i. p. 167, Theil ii. p. 157.
Vola laqueata, Dunker, Ind. Moll. Japon., p. 213.
Pecten antonii, Philippi, Abbild., vol. i. p. 99, pl. i. figs. 1*a*–1*c*.

Habitat.—Station 233A, off Kobé, Japan, in 50 fathoms; blue mud.

This very fine species has also been recorded from Yedo, Nagasaki, and Hakodadi, and probably does not extend to California as stated by Reeve.

Amussium, Klein.

Amussium pleuronectes (Linné).

Ostrea pleuronectes, Linné, Syst. Nat., ed. 12, p. 1145.
Pecten pleuronectes, Sowerby, Thes. Conch., vol. i. p. 55, pl. xvi. figs. 127, 128, 135, 136.
Pecten pleuronectes, Reeve, Conch. Icon., vol. viii. pl. xiii. fig. 48.

Habitat.—Station 203, Philippine Islands, in 20 fathoms; and Station 188, south of New Guinea, in 28 fathoms.

The Philippine specimens of this well-known species are like that figured in Reeve's work, but those from the North Australian region have the coloured valve curiously ornamented with angular brown markings, disposed somewhat regularly in radiating series, and towards the umbones the minute white dots which are usually noticeable are arranged in rays also.

Amussium dalli, n. sp. (Pl. XXII. figs. 7–7*c*).

Testa tenuissima, compressa, hyalino-albida, æquivalvis, elongata. Valvæ sculptura diversa ornatæ, altera (?dextra) conspicue nitente, incrementi lineis striisque tenuissimis sculpta, altera liris concentricis tenuibus ornata, undique minutissime cellulosa. Auriculæ parvæ, subæquales, utrinque acute angulatæ, in valva dextra lateribus paulo concavis. Pagina interna fulgens, liris undenis radiantibus albis haud ad marginem productis instructa.

This species is longer from the beaks to the lower margin than from side to side. It is almost equivalve, the smoother valve, which I regard as the right, being perhaps a trifle more swollen than the other. It is a very thin fragile shell, semitransparent and very glossy, particularly the right valve, which has a more glossy appearance than the left, the latter being of a somewhat thicker texture and of a dilute milky white colour. The valves are differently sculptured. The right merely exhibits the fine concentric lines of growth and very fine radiating substriæ. The left is more beautifully ornamented, being concentrically closely and finely lirate, and throughout microscopically shagreened, the outer or surface-layer being composed of countless excessively minute closely packed crystal-like bodies having unequal sides, varying in number from four to six, and flat outer and basal surfaces. The beaks are acute, and converge to an angle of about 110 degrees. The ears are small, about equal on both sides, slighty concave laterally in the right valve. The interior is very glossy, strengthened by eleven fine radiating costellæ, which, with the exception of the two very short uppermost, only extend about half-way across the surface of the right valve, and rather further in the left, in which also they are a trifle thicker.

Length 48 mm., height 52, diameter 8.

Habitat.—Station 33, off Bermudas, in 435 fathoms; coral mud.

This fine species is dedicated to Mr. W. H. Dall as a mark of high esteem on account of his many and valuable papers on malacology.

Amussium watsoni, n. sp. (Pl. XXII. figs. 8–8*c*).

Testa tenuissima, subdiaphana, albida, paulo inæquivalvis, subcircularis, sericato-nitens, utrinque conspicue hians. Valvæ compressæ, diverse sculptæ. Valva dextra profundior, pallidissime fuscescens, liris confertis concentricis prope marginem angustissime lamellatis ornata, sinistra similiter lirata, sed etiam liris gracilibus radiantibus umbones versus præcipue cancellata. Auriculæ parvæ, incrementi lineis aliisque radiantibus instructæ. Pagina interna nitida, marginem versus leviter iridescens, liris albis radiantibus 10–12 haud ad marginem extensis munita.

This charming species is almost circular, very thin and fragile, considerably gaping on both sides above the middle, a little inequivalve, the one valve which I regard as the right being a trifle more swollen than the other. It is also a trifle thinner and of a very light brownish tint. The left valve is of a milky white colour, and consequently rather less transparent. The exterior of the valves is beautifully glossy and has a silky appearance. Both are very finely, concentrically lirate, the lirae towards the outer margin in the right valve being very narrowly lamellated. In addition to this ornamentation the left valve exhibits numerous fine radiating lirae, which are decidedly elevated for a short distance around the umbones, and then gradually, further out, take the form of faint substriations. The ears are of moderate size, about equal on each side, and sculptured with elevated lines of growth and others diverging from the beaks, the former sometimes forming a sort of serrate dorsal edge. The umbones are moderately acute, with an angle of divergence of about 125 degrees. The interior is glossy, somewhat iridescent around the margin, and strengthened with from five to six pairs of white riblets of different lengths, the longest becoming obsolete at some distance from the circumference.

Length 50 mm., height 52, diameter 9½.

Habitat.—Station 218, north-east of New Guinea, at a depth of 1070 fathoms.

This lovely species, one of the prizes of the Expedition, I feel much pleasure in naming after my friend the Rev. R. Boog Watson.

Amussium caduceum, n. sp. (Pl. XXIII. figs. 1–1*c*).

Testa tenuissima, pellucida, rotundata, compressa, superne angustata, producta, paulo inæquivalvis (valva dextra sinistra leviter convexiore) utrinque conspicue hians. Valva

dextra polita, concentrice exilissime striata, striisque radiantibus obsoletis sculpta; sinistra nitida, concentrice minuta lamellata, minutissimeque radiatim striata. Auriculæ minimæ, subæquales. Pagina interna nitida, liris albis tenuibus denis instructa.

This species is rather higher than long, rounded, but narrowed and produced above. It is very thin, slightly inequivalve, gaping considerably on both sides, glossy, pellucid around the outer margin, and rather thicker and more opaque towards the beaks. The right valve is the deeper, somewhat more shining than the left, exhibiting very fine lines of growth and indistinct radiating substriations. The left valve is more strongly concentrically sculptured, and the radiating striæ are more dense and stronger. The auricles are very small and almost of the same size. The beaks are acute, forming an apical angle of about 105 degrees, the converging dorsal lines being slightly concave. The interior of the valves towards the umbones, and rather more than half way across the valves, is more opaque than exteriorly, and is strengthened by ten white slender liræ of different lengths. The outer pellucid zone of the right valve is very prettily blue-prismatic within.

Length 20 mm., height 22, diameter $4\frac{1}{2}$.

Habitat.—Station 207, west of the island of Luzon, Philippines, at a depth of 700 fathoms; blue mud.

The chief characteristics of this species besides form, are its fragility, fine sculpture, glossy surface, and the ten radiating costellæ. The right valve is somewhat yellowish, and the left whiter.

Amussium jeffreysii, n. sp. (Pl. XXIII. figs. 2 2*c*).

Testa tenuissima, paulo inæquivalvis, oblique rotunde ovata, utrinque conspicue hians, subnitida, valvis dissimiliter sculptis, diverseque coloratis dextra superne in medioque aurantiaca, marginem versus pallida diaphana, radiatim tenuiter lirata, incrementique lineis ornata, valva sinistra superne in medioque quam dextra pallidiore, inferne pellucida, concentrice tenuiter lirata. Auriculæ parvæ, subæquales, ad latera obliquæ, postica valvæ sinistræ ceteris leviter dissimile. Pagina interna nitens, liris radiantibus inæqualibus albis abrupte terminatis circiter 15 instructa.

This very beautiful species is higher than long, compressed, gapes considerably at the sides, is slightly oblique, roundly ovate, and a little inequivalve. The valves are very thin, somewhat differently coloured, and ornamented with different sculpture. The deeper valve (regarded as the right) is more brightly coloured, having the upper and central portion tinted bright orange, and the outer border very much paler and transparent. It is sculptured with numerous fine rounded liræ which radiate from the beak and extend almost to the circumference all round. In addition it is marked with

fine concentric lines of growth, producing, chiefly towards the umbo, a distinctly cancellated surface. The other valve is much paler than the right, and adorned throughout with numerous fine concentric lirae. The beaks are acute, converging with slightly concave sides to an angle of about 114°. The ears are small, about equal on both sides, feebly sculptured with striae of growth and oblique at the sides. The posterior of the left valve differs from the rest in having a very small sinus where it joins the dorsal slope of the valves. The interior is coloured like the outside very glossy, and strengthened with about fifteen white radiating lirae which terminate abruptly and extend over the tinted portion of the valves. Some of them in certain specimens are very short, and are not produced towards the beaks like the rest, which gradually attenuate upwards.

Length 19½ mm., height 21½, diameter 5.

Habitat.—Station 210, Philippine Islands, in 375 fathoms; blue mud.

This species is remarkable for the orange colour of the right valve and the fleshy tint of the left, also for the strongish and abruptly terminating internal lirae. I name it with much pleasure after my late friend Dr. Gwyn Jeffreys, of "British Conchology" renown.

Amussium torresi, n. sp. (Pl. XXIII. figs. 3–3*b*).

Testa parva, compressa, tenuis, subpellucida, alba, leviter inæquivalvis, valvæ diverse sculptæ, marginibus supernis levissime concavis. Valva (dextra?) paulo convexior, nitida, incrementi lineis minime conspicuis sculpta, sinistra liris confertis tenuissimis concentricis ornata. Auriculæ parum inæquales, postica paulo majore, in valva sinistra striis paucis radiantibus prope marginem obliquum dorsalem signata. Pagina interna nitens, radiis tenuissimis duodenis inæqualibus instructa.

This species, so far as at present known, appears to be of small size. It is very thin, scarcely gaping at the sides, slightly inequivalve, very much compressed, and semitransparent white. The valves are about as long as high, have acute beaks and faintly concave dorsal slopes, the apical angle being of about 105 to 110 degrees. The valve regarded as the right is a trifle deeper than the other, and nearly quite smooth and glossy, exhibiting only the feeblest indications of lines of growth, the left valve, on the contrary, being prettily ornamented with very fine and close-set concentric lirae. The auricles are unequal in size, the posterior being considerably larger, that of the left valve exhibiting a few (two or three) striae near the dorsal slope. The interior is glossy, and strengthened with twelve slender radiating lirae, of which the two uppermost are very small and insignificant.

Length 8 mm., height 8½, diameter 2.

Habitat.—Station 185B, east of Cape York, North Australia, in 155 fathoms; coral sand.

This species differs from *Amussium caducum* not only in having more internal costellæ but also in form and the sculpture of the exterior.

Amussium scitulum, n. sp. (Pl. XXIII. figs. 4–4*b*).

Testa (juvenis?) parva, compressa, alba, tenuis, subæquivalvis. Valva dextra lineis incrementi paucis hic illic cæteris majoribus instructa, sinistra liris numerosis radiantibus, aliisque minus conspicuis concentricis concinne cancellata. Auriculæ mediocres, paululum inæquales, antica valvæ dextræ prope marginem obliquum dorsalem canaliculata, lirisque radiantibus paucis subgranulosis ornata, et antica et postica in valva sinistra cancellatis. Pagina interna liris tenuibus circiter denis ad marginem productis instructa.

Of this species only a few valves were obtained, possibly representing but the young form of it. It is a thin shell, semitransparent white, a trifle inequivalve, much compressed, and about as long as high. The right valve is slightly deeper than the left, and sculptured only with the concentric lines of growth, of which a few are more raised than others. The left valve, in addition to the raised lines of growth, has a considerable number of fine radiating liræ, giving the surface a more or less cancellated appearance. The beaks are acute, the converging dorsal lines meeting at an angle of about 90 or 95 degrees. The ears are a little unequal, the anterior of the right valve being somewhat channelled close to the oblique dorsal slope and ornamented with a few radiating raised lines which are somewhat granular or subsquamous through being crossed by other raised lines of growth. The posterior auricle in this valve, on the contrary, is almost destitute of sculpture. Both ears in the left valve have radiating and cross liræ, the former predominating, and being, on the anterior auricle, prettily scaled near the dorsal slope. The internal liræ are ten in number and produced to the outer margin, where sometimes they are slightly thickened.

Length $4\frac{1}{2}$ mm., height $4\frac{1}{2}$, diameter $1\frac{1}{3}$.

Habitat.—Station 188, south of New Guinea, in 28 fathoms; green mud.

This species differs from *Amussium torresi* in sculpture and the number of internal ridges.

Amussium squamiferum, n. sp. (Pl. XXIII. figs. 5–5*a*).

Testa equilateralis, convexiuscula, rotundata, alba, subpellucida. Valva dextra concentrice laminata, lamellis tenuissimis numerosis supra porcas nonnullas radiantes

obsoletas pulcherrime squamatis. Umbones parvi, acuti, lævigati; auriculæ paulo inæquales, postico majori, incrementi lineis lamellatis radiisque obsoletis divergentibus instructi. Liræ internæ undecim gracillimæ, extremitatibus parum incrassatis.

This species, of which only a few right valves are at present known, is a little convex, equilateral, rounded, but rather longer from the hinge to the ventral margin than across from side to side. It is very thin, whitish, and slightly pellucid. The right valve is sculptured with numerous very fine concentric laminæ, which are altogether wanting on the acute glossy beak, and towards the lower margin, in some instances, become rather more crowded than elsewhere. They have an undulating character through crossing slightly elevated radiating ridges. These vary in number according to the size of the specimen, being about fifteen in small valves, and twice that number in the largest under examination, every alternate ridge extending only about half-way from the circumference to the umbo. Upon these rays the concentric lamellæ, when not worn, are elevated into vaulted scales, giving a very pretty appearance to the shell. The ears are small, somewhat unequal, the front one being rather the larger. They are ornamented with the terminations of the concentric laminæ, which pass over two or three obsolete rays, more noticeable on the posterior than the anterior side. The acuteness of the beak is somewhat variable, the apical angle of divergence being 100 to 113 degrees. The internal surface is glossy, and strengthened usually with eleven radiating liræ, but at times here and there an intervening short one is met with. They are very slender, thread-like, scarcely thickened at the extremities (excepting two or three of the uppermost), and gradually disappear as they approach the umbonal region.

Length 12 mm., height 13, probable diameter 3.

Habitat.—Station 24, off Culebra Island, West Indies, at a depth of 390 fathoms; also Station 33, off Bermuda, in 435 fathoms.

Amussium obliquum, n. sp. (Pl. XXIII. figs. 6–6*a*).

Testa compressa, tenuissima, semipellucida, umbones versus nitens, obliqua, irregulariter rotundata. Valva sinistra inæquilateralis, liris concentricis tenuissimis instructa. Auriculæ valde inæquales, postica longe majori, superne acute angulata, inferne ab valva sulco angusta profundo sejuncta. Umbo mediocriter acutus, latere obliquo postico longiore. Liræ radiantes internæ circiter sedecim, quarum paucæ superiores crassiores videntur.

As but a single minute and probably young left valve is all that is at present known of this species, it is with considerable hesitation that I have ventured to describe and impose a name upon it.

It is compressed, very thin, semitransparent, of an oblique growth, so that the hinder side is larger than the anterior. It is sculptured with very slender concentric liræ, which become mere striæ towards the glossy umbo. This is moderately acute, the converging sides, of which the posterior is considerably the longer, meeting at an angle of about 122 degrees. The ears are very unequal, the hinder one being decidedly larger, denticulate along the top, and separated beneath from the umbonal slope by a narrow deep groove above, parallel with which is an elevated ridge bordering the auricle. It is acutely angled above and cuts in deeply below. The interior is strengthened with sixteen radiating ridges, the two uppermost (of which that on the posterior side is almost obsolete) forming the base of the ears. One or two of the upper ones on each side are very short, and appear thicker than the rest, although in reality they are not. None extend to the beak, so it is probable that very young shells are destitute of liræ.

Length 3 mm., height $2\frac{3}{4}$.

Habitat.—Station 24, off Culebra Island, West Indies, in 390 fathoms; Pteropod ooze.

This minute valve, although without doubt very young, indicates a species of a peculiar oblique growth distinct from any as yet known.

Amussium propinquum, n. sp. (Pl. XXIII. figs. 7–7*b*).

Testa valde compressa, tenuissima, pellucida, nitida, rotundata; valva dextra lævis, incrementi lineis parum conspicuis sculpta, sinistra radiatim tenuiter lirata. Auriculæ subæquales, lateribus concavis. Pagina interna nitida, liris capilliformibus duodenis instructa.

This species, of which only two odd valves are at present known, is very fragile, pellucid, much flattened, glossy, and about equilateral. It is of a rounded form, perhaps a trifle longer than high, and has rather a long hinge-line. The auricles are small, not quite equal, those of the right valve (the only one perfect at this part) being decidedly concave at the sides, and sculptured with fine lines of growth. The umbones are small, project a trifle beyond the straight hinge-margin, and have the sides very faintly concave and converging to an apical angle of about 125 degrees. The right valve is smooth, exhibiting only very fine lines of increase, which, however, are rather more visible near the outer margin than elsewhere. The left valve, besides these concentric striæ, is sculptured with numerous fine radiating liræ. The interior of the valves is glossy, and strengthened with twelve excessively fine hair-like liræ, which attain neither to the umbones nor to the circumference. The shorter ones beneath the ears are the thickest. The left valve appears radiately striated within, each stria corresponding with an external lira. The ligamental pit is very minute.

Length $7\frac{1}{2}$ mm., height $6\frac{2}{3}$.

Habitat.—Station 78, east of the Azores, at a depth of 1000 fathoms; volcanic mud.

This species, although bearing a general resemblance to *Amussium lucidum*, differs (judging from the only two valves known) in being proportionally shorter from the beaks to the ventral outline, in comparison with the transverse diameter. Its hinge-line is longer, the apical angle of the beaks less acute, the left valve is radiately lirate instead of concentrically striate, the anterior ear in the same valve is quite distinct in form, and the internal liræ are more slender and fewer than in the Azorean examples of *Amussium lucidum*.

Amussium cancellatum, n. sp. (Pl. XXIII. figs. 8–8*c*).

Testa compressa, parum pellucida, albida, haud polita, æquilateralis, rotundata, paulo inæquivalvis, valvis diverse sculptis. Valva dextra profundior, liris tenuissimis radiantibus numerosis aliisque gracilioribus confertioribus concinne cancellata, sinistra concentrice sulcata, sulcis regularibus, tenuibus, sensim accrescentibus. Auriculæ inæquales, posticis majoribus. Umbones acuti, lateribus convergentibus leviter concavis. Linea cardinis brevis, recta, fossa mediana ligamenti parva instructa. Pagina interna nitens, liris mediocriter fortibus circe 12 (aliis minoribus sæpe interpositis) munita.

This species is as a rule a trifle longer from the beaks to the lower margin than from side to side. It is compressed, slightly inequivalve, only a little transparent, whitish, hardly at all glossy, and has the valves differently sculptured. The right or somewhat deeper valve is ornamented with numerous fine thread-like radiating liræ, which are crossed by still finer concentric ones. The former are more slender and closer together down each side than towards the middle of the valve, and the latter, besides being finer than the radiating liræ, are also much more approximated to one another, those near the beaks being further apart than the rest. The left valve has somewhat of a silky appearance, and is finely and closely concentrically lirate, the liræ gradually becoming thicker and more remote with the growth of the shell. The auricles are small, somewhat unequal, the posterior being rather larger than the anterior. They are sculptured with fine lines of growth and sometimes denticulate at the top. The posterior end of the left valve is sinuated below, and is separated from the main part of the valve by a deepish groove, in which a slender ridge runs parallel with the dorsal slope. The beaks are small, acute, the slightly concave sides converging to an angle of about 117 degrees. The glossy interior of the valves is strengthened with numerous white fairly strong radiating liræ, visible exteriorly, especially in the right valve, which is a little more transparent than the left. They are about twelve in number, somewhat thickened towards the outer extremities,

which in adult shells do not reach the outer margin of the valves. Between the outer ends very short intervening ones are frequently met with, varying in number and length.

Length 16 mm., height 18, diameter $4\frac{1}{2}$.

Habitat.—Stations 33 and 56, off Bermuda, in 435 and 1075 fathoms; Station 24, off Culebra Island, in 390 fathoms, and off St. Thomas (depth not stated).

This species is without difficulty separable from *Amussium lucidum* by its different sculpture, stronger substance, thicker internal liræ, and different form of the auricles. The left valve is rather like that of the above-named species in respect of sculpture, but is less glossy and more strongly concentrically ridged.

Amussium meridionale, n. sp. (Pl. XXIV. figs. 1–1*a*).

Amussium lucidum, var. *striata*, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 562.

Testa fragilissima, paulo inæquivalvis, iridescens, pellucida, utrinque anguste hians. Valva dextra liris filiformibus numerosis radiantibus, incrementique lineis concentricis ornata, sinistra magis opaca concentrice lirata, liris tenuissimis, complanatis, sensim accrescentibus. Auriculæ subæquales, anticis interdum paulo majoribus. Pagina interna nitida, iridescens, liris tenuissimis undenis instructa, in valva dextra radiatim striata, striis cum liris externis congruentibus.

Var.; Testa liris internis duodenis munita, valva dextra extus cancellata.

This species is slightly oblique, excessively thin, a little inequivalve, pellucid white, and narrowly gaping above on both sides. The right or deeper valve is more glossy than the left, and sculptured with numerous very slender radiating liræ and concentric waves and striæ of growth. The other valve is ornamented with close-set very fine concentric shallow grooves and depressed ridges. The former under the microscope exhibit a very minute reticulation, each parallel zone of this fine net-work being connected with the one above and below by elongate meshes passing over the intervening ridges. The auricles are small, at times denticulated above, slightly unequal, the anterior being rather larger than the posterior, or this proportion may be reversed. The beaks are moderately acute, the sides meeting at an angle of about 115 degrees. The valves are glossy, somewhat iridescent within, and strengthened with eleven fine liræ, the longest of which extends about two-thirds across the interior. The right valve is also very finely striated, the striæ corresponding to the slender liræ of the outer surface.

Length 14 mm., height 14, diameter 4.

Habitat.—Station 158, in the Southern Ocean, south of Australia, at a depth of

1800 fathoms. Also Station 146, Southern Ocean, east of Marion Island, in 1375 fathoms. Also Station 302, west of Patagonia, in 1450 fathoms.

The young of *Amussium dalli* must approach very closely to this species. It may, however, be distinguished on account of the more acute umbonal angles and the different character of the surface structure of the left valve.

The specimens from Station 302 present one or two differences from those found at the two other localities. The right or deep valve has some of the concentric lines of growth elevated into slender liræ, which, crossing those radiating from the beak, produce a distinctly cancellated surface. Besides this, the valves are strengthened with twelve instead of eleven radiating liræ. However, taking into consideration the exact similarity of the microscopic sculpture of the left valve, I believe it advisable to consider this form merely as a variety. It is most surprising to me that this species could for an instant be considered as a variety of *Amussium lucidum*. Any one holding such a view certainly must either be wanting in perceptive power or his ideas respecting what are usually regarded as species be very peculiar. If any two species of this genus are to be easily distinguished, those in question are they. *Amussium meridionale* is larger, gapes on both sides, has both valves differently sculptured, a shorter hinge-line, and the posterior auricle in the left valve is differently sculptured. In specimens from a depth of 1000 fathoms, off the Azores, identified by the late Dr. Gwyn Jeffreys as his *Amussium lucidum*, this ear has two or three radiating ridges crossed by strong lines of growth, the former being wanting in *Amussium meridionale* and the latter much finer. The Azorean examples also differ in being quite closed at the sides.

Amussium lucidum, (Jeffreys) (Pl. XXIV. figs. 2–2*c*).

> *Pleuronectia lucida*, Jeffreys, in Wyville Thomson, Depths of the Sea, p. 464, figs. 78, *a*, *b*.
> *Amussium lucidum*, Jeffreys, Ann. and Mag. Nat. Hist., 1876, vol. xviii. p. 425.
> *Amussium lucidum*, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 562.

Habitat.—Station 73, west of Azores, in 1000 fathoms; Station 78, off San Miguel, Azores, also in 1000 fathoms; Station 120, off Pernambuco, Brazil, at a depth of 675 fathoms.

The Azorean specimens appear to differ in one respect from those originally described by Jeffreys. The latter are said to have only nine internal supporting liræ, the figure, however, in Thomson's book giving ten. In two valves in the British Museum I find eleven, and in the Challenger examples usually fourteen, one or two of them occasionally being only partially developed towards the outer margin.

Family Ostreidæ.

Ostrea, Linné.

Ostrea imbricata, Lamarck.

Ostrea imbricata, (Lamarck) Sowerby, Conch. Icon., vol. xviii. pl. xvii. figs. 36, *a*, *b*.

Habitat.—Station 188, south of New Guinea, in 28 fathoms; green mud.

A single small specimen obtained at the above locality agrees with this species as determined by Sowerby, examples of which from China and Japan may be seen in the British Museum.

Besides this shell, another of immature growth, and belonging to a distinct species, was dredged at Station 162, off East Moncœur Island, Bass Strait, in 38 fathoms; and four young odd valves, respectively from Fayal, Bermuda, the Philippines, and Tongatabu, none of which are safely identifiable, were also secured.

Family Anomiidæ.

Anomia, Linné.

Anomia ephippium, Linné, var.

Anomia ephippium, Linné, Syst. Nat., ed. 12, p. 1150.
Anomia ephippium, Forbes and Hanley, Brit. Moll., vol. ii. p. 325, pl. lv. figs. 2, 3, 5, 7, and Pl. T. fig. 2.
Anomia ephippium, Jeffreys, Brit. Conch., vol. ii. p. 30, pl. i. fig. 4, vol. v. p. 165, pl. xx. fig. 1.
Anomia ephippium, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 554.

Habitat.—Station 122, off Pernambuco, Brazil, in 350 fathoms; and off Nightingale Island, Tristan da Cunha, in 100 to 150 fathoms.

A few small valves from these localities apparently belong to this well-known European form. It has not, I believe, been previously obtained so far south.

Anomia laqueata, Reeve, var. (?).

Anomia laqueata, Reeve, Conch. Icon., vol. xi. pl. iv. figs. 18, *a*, *b*.
Anomia laqueata, Schrenk, Reise Amur-Lande, vol. ii. p. 474.
Anomia laqueata, Dunker, Index Moll. Japon., p. 248.

Habitat.—Station 233A, off Kobé, Japan, in 50 fathoms.

The locality of this species was unknown to Reeve, and was first assigned to it by Schrenk. The Challenger specimens are smaller than the type, and do not exhibit the radiating ridging depicted in Reeve's figure. They possibly are merely a smooth variety, however, for the species of this genus, as in *Ostrea*, *Spondylus*, and some other genera, are excessively variable and very difficult to determine.

APPENDIX.

Since the foregoing Report passed through the press a few additional species which had previously been overlooked have been transmitted to me for examination. They are all from great depths in the North Pacific Ocean, and, as might be expected, appear to be new to science. They do not, however, present any very remarkable features, but it is very interesting to note that four of the five species are represented in the Atlantic by forms which are all but identical.

Neæra murrayi, n. sp.

Testa elongata, gracilis, postice rostrata, inæquivalvis, alba, tenuis, liris concentricis tenuibus subdistantibus postice ad carinam obliquam filiformem obsoletis instructa. Margo dorsi anticus leviter arcuatus, vix declivis, posticus elongatior, oblique concavus. Margo inferior in medio parum excurvus, infra rostrum haud profunde sinuatus. Rostrum angustum, ad extremitatem curvatum, supra carinam incrementi lineis striatum lirisque paucis radiantibus inconspicuis ornatum. Cardo edentulus. Ligamentum parvum, postice inclinatum.

This is a very slender species, of thin texture, narrowly rostrate behind, and inequivalve, the right valve being a little smaller than the left. It is white, with a dull surface, and sculptured with very slender thread-like liræ which are further apart upon the central portion of the valves than towards the lower margin, and become obsolete or mere striæ at the oblique keel, which bisects the rostrate end. The rostrum itself is rather slender, slightly up-turned, curved at the extremity, and sculptured with fine lines of growth and a few very feeble radiating raised lines above the oblique keel. The umbones are small, slightly in front of the centre, and posteriorly inclined. The hinge is altogether toothless, and the ligament is small and directed obliquely towards the hinder side. The interior of the valves is glossy, and, owing to their thinness, exhibits the external sculpture.

Neæra murrayi, n. sp.

Length 6 mm., height $2\frac{1}{3}$, diameter 2.

Habitat.—Station 244, Mid North Pacific Ocean, in 2900 fathoms.

This very delicate little species is readily separable from any of the species previously described in this Report by the fine and rather remote concentric liræ. It belongs to Section M of the genus (see p. 38), characterised by a toothless hinge, concentric sculpture, and a small posteriorly inclined ligament.

Callocardia (?) *pacifica*, n. sp. (*vide* p. 156).

A second specimen of this species, from the same locality, has fortunately been preserved, having exactly the form of that previously described. The hinge in the right valve is quite of the same character as that of *Callocardia adamsii*, consisting of a long irregular tooth beneath and posterior to the beak, and a much shorter erect tooth in front, separated from the posterior by a small notch, or, in other words, the hinge might be said to consist of one elongate irregular tooth subdivided towards the anterior end by a small notch.

Leda prolata, n. sp.

Testa parva, æquilateralis, antice acute rotundata, postice breviter rostrata, nitida, albida, incrementi striis sculpta. Margo dorsi utrinque subrectilinearis, leviter obliquus, ventralis curvatus, postice ad rostrum haud profunde sinuatus. Umbones ad apicem obtusi, paulo prominentes.

Length 5 mm., height $3\frac{1}{2}$, diameter $1\frac{2}{3}$.

Habitat.—Station 256, July 21, 1875; lat. 30° 22′ N., long. 154° 56′ W.; depth, 2950 fathoms; bottom, red clay; Mid North Pacific Ocean, north of the Sandwich Islands.

Leda prolata, n. sp.

This species very closely resembles *Leda rectidorsata* of Seguenza, and was dredged in deeper water than any other Lamellibranch obtained during the Expedition. There being but a single specimen, I have not ventured to open the valves in order to examine the hinge.

Yoldia hoylei, n. sp.

Testa parva, tenuis, ovata, inæquilateralis, nitida, albida vel dilutissime olivacea, striis incrementi tenuissimis sculpta. Umbones parvi, parum prominentes, paulo excentrici. Linea cardinis gracilis, dentibus erectis sex utrinque instructa.

Yoldia hoylei, n. sp.

This species, judging from the two specimens at hand, is small, ovate, highly glossy, a little inequilateral, and sculptured with very fine lines of growth. The valves are very thin, almost equally rounded at the ends, but the curve on the longer

side is rather higher up than in front. The dorsal margin is straightish on each side the beaks, which are small, slightly prominent, and rather excentric. The hinge is slight, and armed with about six teeth on each side the small ligament-pit. The interior is bluish-white.

Length $3\frac{2}{3}$ mm., height $2\frac{1}{2}$, diameter $1\frac{1}{3}$.

Habitat.—Station 244, Mid North Pacific Ocean, in 2900 fathoms.

Leda jeffreysi, Hidalgo, is the Atlantic analogue of this species.

Arca (*Barbatia?*) *imitata*, n. sp.

Testa forma habituque *Arcæ friclei* simillima, æquivalvis, oblique rotundata, subglobosa, inæquilateralis, albida, epidermide tenui pilosa pallide fuscescente induta. Valvæ tenues, liris tenuibus radiantibus aliisque concentricis paulo minus conspicuis cancellatæ.

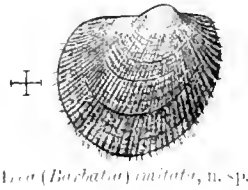
Length $3\frac{2}{3}$ mm., height 3, diameter $2\frac{1}{3}$.

Var.; Testa magis elongata.

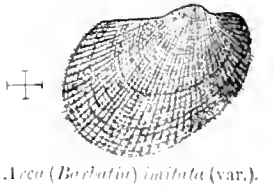
Length $4\frac{1}{2}$ mm., height $3\frac{1}{4}$, diameter $2\frac{1}{3}$.

Habitat.—Station 244, Mid North Pacific Ocean, in 2900 fathoms.

This interesting form belongs to a small group of species which bear a strong family likeness to one another, namely, *Arca pectunculoides*, *Arca friclei*, *Arca inæquisculpta*, *Arca culebrensis*, and a few others.



Arca (*Barbatia*) *imitata*, n. sp.



Arca (*Barbatia*) *imitata* (var.).

Arca imitata differs from specimens of *Arca pectunculoides* of similar size in being more coarsely clathrate and in having the valves equal, whereas, in the latter species, the right is smaller than the left. *Arca culebrensis* is a more elongated shell than that under consideration, *Arca inæquisculpta* differs in having the valves differently sculptured and of unequal size, and *Arca friclei* has rather finer sculpture and is somewhat different in outline. The distinctions above mentioned are but slight, and based upon very limited material, and, without comparison of the specimens, it is impossible to discriminate the different species. I have already recorded (p. 3) the existence of two all but identical species of the same genus occurring at the above locality and at a great depth in the Atlantic. Here again is an instance in which the genus *Arca* has almost exactly similar representatives in the two oceans, at enormous depths.

APPENDIX II.

Since receiving the specimens described in the preceding Appendix, a few others have been forwarded to me for examination. They consist of a *Malletia*, a *Leda*, a *Glomus*, one *Limopsis*, two species of *Arca*, and a *Spondylus*. They are of special interest in coming from Stations from which Lamellibranchs have not previously been reported, and all, excepting the *Limopsis* and the *Arcæ*, are new and very interesting species.

Malletia dunkeri, n. sp.

Testa parva, inæquilateralis, nitidissima, iridescens, semipellucida, tenuissima, vix concentrice striata, oblonga, antice angustata, acute rotundata, postice latior, subquadrate arcuata. Margo dorsi anticus brevis, declivis, vix arcuatus, posticus longior, rectiusculus, horizontalis; margo inferior late curvatus. Umbones parvi, albidi, aliquanto obtusi, circa in $\frac{1}{3}$ longitudinis collocati. Dentes cardinis ad sedecim in utraque valva, haud acuti. Ligamentum externum angustum, lineare.

Malletia dunkeri, n. sp.

This species is considerably inequilateral, excessively thin, semitransparent, highly glossy, iridescent, and exhibits but very faint lines of growth. It is longer than high, narrower and more sharply rounded in front than behind. The front portion of the dorsal margin is short, very sloping, and a little excurved. The posterior side is much longer, horizontal, and also only very little arcuate. The ventral outline is widely curved, and ascends obliquely behind rather further than in front, so that the posterior extremity is higher up than the anterior. The beaks are rather obtuse, very little prominent, opaque white, and situated at less than a third the length of the shell from the anterior end. The hinge consists of about sixteen squarish-topped teeth in each valve, of which about ten are behind the umbones and the rest in front, and, owing to the thinness and transparency of the shell, are clearly visible when the valves are closed. The ligament is very slender, and, commencing between the beaks, extends a short distance behind them.

Length 5 mm., height $3\frac{1}{2}$, diameter $2\frac{1}{3}$.

Habitat.—Station 237, off the south-east of Nipon, Japan, in 1875 fathoms.

This is quite distinct from all the known species of *Malletia*, and is the only one at present known from Japanese Seas. I have named it after the late Dr. W. Dunker, author of several papers and valuable works on the Mollusca of Japan.

Leda ultima, n. sp.

Testa minuta, ovato-subtriangularis, convexa, antice rotundata, postice angustata, subrostrata, flavescens, parum nitida, liris tenuibus concentricis confertis regularibus sculpta. Margo dorsi utrinque æqualiter declivis, antice vix curvatus, postice rectus. Margo inferior late arcuatus, extremitatem posticam versus ad terminum impressionis latæ ab umbone radiantis incurvatus. Umbones albi, læves, centrales, involuti, haud acuti. Linea cardinalis crassa, dentibus circiter sex utrinque instructa.

This little species is rather thick in texture, considerably convex, ovate but narrowed at the hinder end into a short rostrate extremity. It is white, clothed with pale straw-coloured epidermis except at the umbones, which consequently appear white, and are smooth, central, slightly prominent, rather obtuse and incurved at the tip. The valves are marked with a distinct broad radiating depression down the posterior side, and sculptured with numerous regular fine close-set concentric liræ which become more slender at the sides. The dorsal line is considerably sloping on both sides, the least excurved in front, straight at first behind the beaks, then down-curving to the sharpish rostrate extremity. The ventral margin is well curved in front and along the middle portion of the valves, but distinctly sinuate at the termination of the oblique impression. The hinge-plate is very strong and broad for so small a species, and furnished with six or seven teeth on each side the small central triangular ligamental pit. The interior is glossy, and exhibits distinct deep muscular scars.

Leda ultima, n. sp.

Length 2½ mm., height 2, diameter 1½.

Habitat.—Station 5, February 21, 1873; lat. 24° 20′ N., long. 24° 28′ W.; south-west of the Canary Islands; depth, 2740 fathoms; bottom, red clay.

Leda messanensis is more sharply beaked behind than this species, more finely sculptured, more narrowly rounded in front, and has a less distinct oblique impression down the posterior side. *Leda semen* is about the same size but more elongate, has finer striæ and a fainter depression.

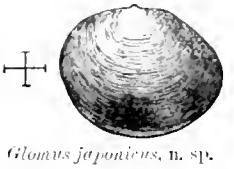
Leda confinis is narrower, smoother, less equilateral, &c.

This little species, which is of thickish substance for a shell living in such deep water, was obtained at a depth of more than 1000 fathoms in excess of that reached by any other *Leda* obtained by the Challenger.

Glomus japonicus, n. sp.

Testa parva, tenuis, rotundato-ovata, subæquilateralis, parum nitida, epidermide tenui flavescente, concentrice tenuiter striata, induta. Margo dorsi anticus primo leviter arcuatus, dein oblique subrecte declivis, ventralis late regulariterque arcuatus. Umbones parvi, paulo prominentes, albi, fere mediani: Ligamentum cardinale obliquum, parvum, postice inclinatum. Dentes circiter septem ante umbones conici, acuti, posteriores ad tredecem magis obliqui, minores. Pagina interna nitida, pallide cæruleo-albida.

This species is longer than high, roundish ovate, rather more pointed in front than behind. It is moderately convex, very thin and fragile, the slightest inequilateral, the anterior end being a trifle longer than the posterior. It is clothed with a thin pale yellowish epidermis, is glossy only at the umbones, and marked with very fine incremental striæ. The beaks are small, white, the least raised above the dorsal line, and situated the slightest behind the centre. The front dorsal margin is shortly curved at first, then descends obliquely in a straightish line to the anterior extremity. The posterior margin descends rather more obliquely from the beaks in a gentle curve. The hinge-plate is feeble and bears about seven conical teeth in front of the centre and twelve or fourteen rather smaller and more oblique ones on the hinder side. The ligament is small, and inclines obliquely towards the posterior side from the tip of umbones. The interior is glossy, and of a pale bluish tint.



Glomus japonicus, n. sp.

Length 5 mm., height $4\frac{1}{4}$, diameter $2\frac{1}{2}$.

Habitat.—Station 237, off the south-east of Nipon, Japan, in 1875 fathoms.

Until the discovery of this species, the genus *Glomus* has only been known as an Atlantic type. This is quite distinct from all the other species, being larger and different in form and dentition.

Limopsis cristata, Jeffreys, var.

Limopsis cristata, Jeffreys, Ann. and Mag. Nat. Hist., 1876, vol. xviii. p. 434.
Limopsis cristata, Jeffreys, Proc. Zool. Soc. Lond., 1879, p. 585, pl. xlvi. fig. 8.

Habitat.—Station 5, February 21, 1873; lat. 24° 20′ N., long. 24° 28′ W.; south-west of the Canary Islands; depth. 2740 fathoms; bottom. red clay.

Limopsis cristata, Jeffr. (type).

Limopsis cristata, Jeffr. (var.).

The single perfect specimen and a few odd dead valves from the above locality do not correspond exactly with the typical examples of this species with which I have compared them. They are rather less oblique in growth, have the anterior side, or that

towards which the umbones incline, somewhat straighter, the crenulation or dentition within the margin of the valves is less developed, and the hinge-teeth appear to be fewer. The character of the external sculpture, however, is exactly similar, and possibly were a larger series of specimens at hand, the above slight differences would prove to be inconstant.

Arca (*Barbatia*) *pteroessa* (*vide* p. 262).

Habitat.—Station 237, June 17, 1875; lat 34° 37′ N., long. 140° 32′ E.; depth, 1875 fathoms; bottom, blue mud (off the south-east coast of Nipon, Japan). Also Station 16, March 7, 1873; lat. 20° 39′ N., long. 50° 33′ W.; depth, 2435 fathoms; bottom, Globigerina ooze (Mid North Atlantic, east of the West Indies).

It is interesting that other specimens of this species have come to hand which were obtained from the Pacific, being confirmatory of its existence in that and the Atlantic Oceans.

Arca (*Scapharca*) *inæquisculpta* (*vide* p. 267).

Habitat.—Station 5, south-west of the Canary Islands, in 2740 fathoms.

A single half-grown example in perfect condition from the above locality shows that this species is, as I suspected, inequivalve, and therefore belongs to the section *Scapharca*. It is clothed with a thin pale brownish epidermis, which, under a strong lens, presents a finely hairy aspect, the short hairs arising from the points of intersection of the slender concentric and radiating liræ. It is interesting to find this species also occurring on the eastern side of the Atlantic, more than 2000 miles from the only other locality whence at present it has been obtained.

Spondylus ostreoides, n. sp.

Testa parva, altior quam longa, alba, inæquivalvis. Valva superior irregulariter planiuscula, incrementi lineis concentricis lamellatis confertis undulatis sculpta. Valvæ inferior—? (tubulis vermium, &c., obtecta). Pagina interna alba, nitida, cicatrice musculari subrotundata distincta notata. Margo valvæ superioris denticulis minutis remotis intus instructus, valvæ inferioris fossis vel puncturis congruentibus sculptus.

The single specimen obtained is of small size, and consequently may not be adult. It is of the same general form as many other species of the genus, but is remarkable

in being concentrically sculptured and lacking the radiating ridges, usually spine-bearing, which, so far as I am aware, are present upon the upper or free valve of every known species. This absence of radiating sculpture, and the lamellated character of the concentric lines of growth, gives this species very much the appearance of a small oyster, which suggested the name *Spondylus ostreoides*. The inner margin of the valves of most species of this genus are fluted, a style of sculpture occasioned by the external ribbing. In the present form this generic character is maintained in a modified form, the upper valve having nearly all round, somewhat remote elongate tubercles which fit into minute pits or punctures in the other valve.

Spondylus ostreoides. 1, exterior; 2, interior of upper valve.

Length 11 mm., height 14, diameter 6.

Habitat.—Station 170, July 14, 1874; lat. 29° 55′ S., long. 178° 14′ E.: depth, 520 fathoms; bottom, volcanic mud (north of the Kermedec Islands).

Most of the known species of *Spondylus* (with the exception of a few brought up on telegraph cables) have hitherto been obtained in comparatively shallow water. The absence of colour in the present form, and its depauperated condition, is probably the result of existing in deeper and colder water than usual, and fine handsome species are not to be expected from such localities. A fact worth mentioning in this place is the presence, upon the upper valve, of a species of Polyzoa, which my colleague Mr. Quelch pronounces without doubt to be *Cribrilina radiata* (Moll.), a form found in shallow water on the British coast.

INDEX.

Note.—Names of Genera and Species obtained during the Expedition are printed in roman type, Synonyms and other Species incidentally referred to in *italics*.

PLATE I.

PLATE I.

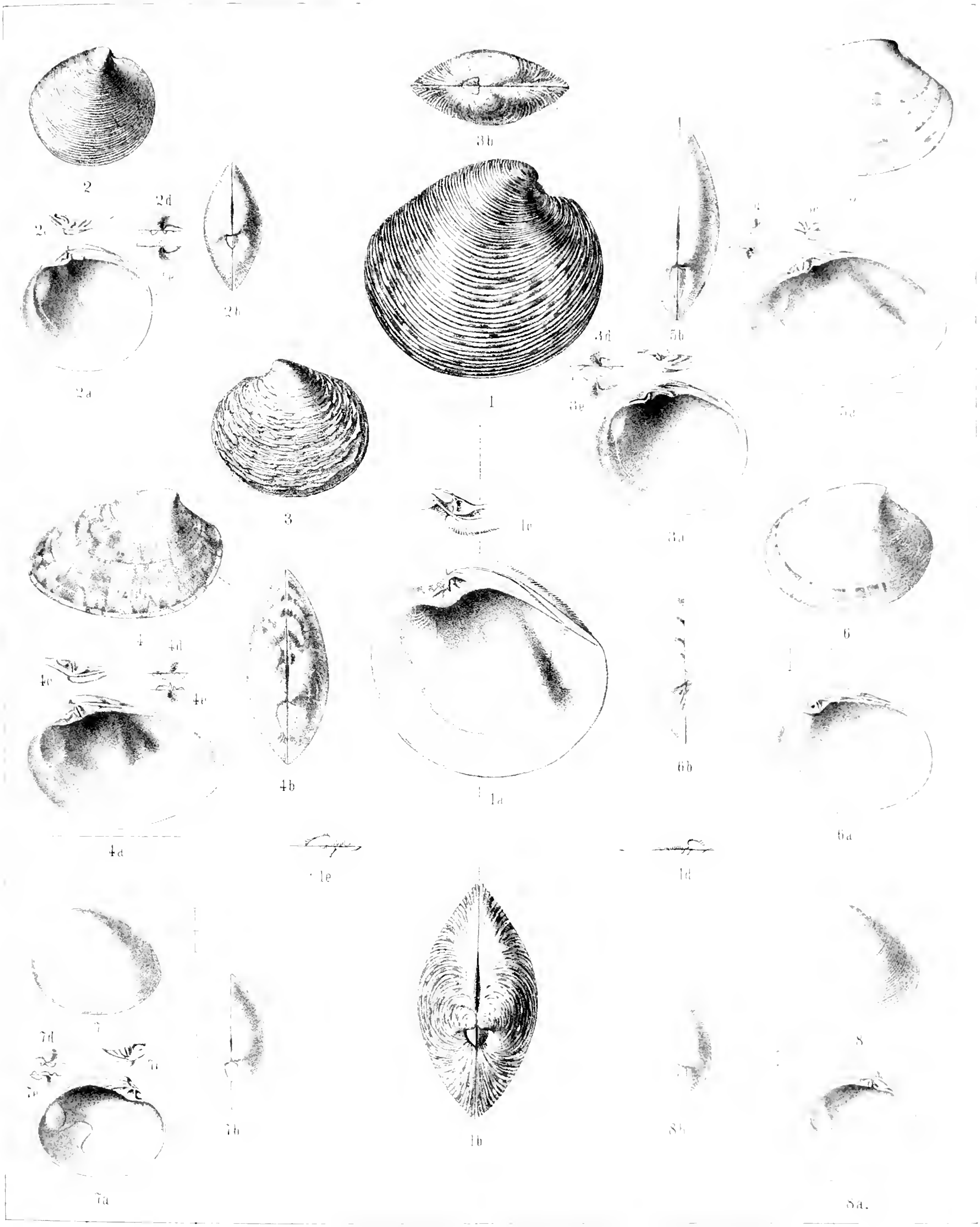


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PLATE II.

PLATE II.

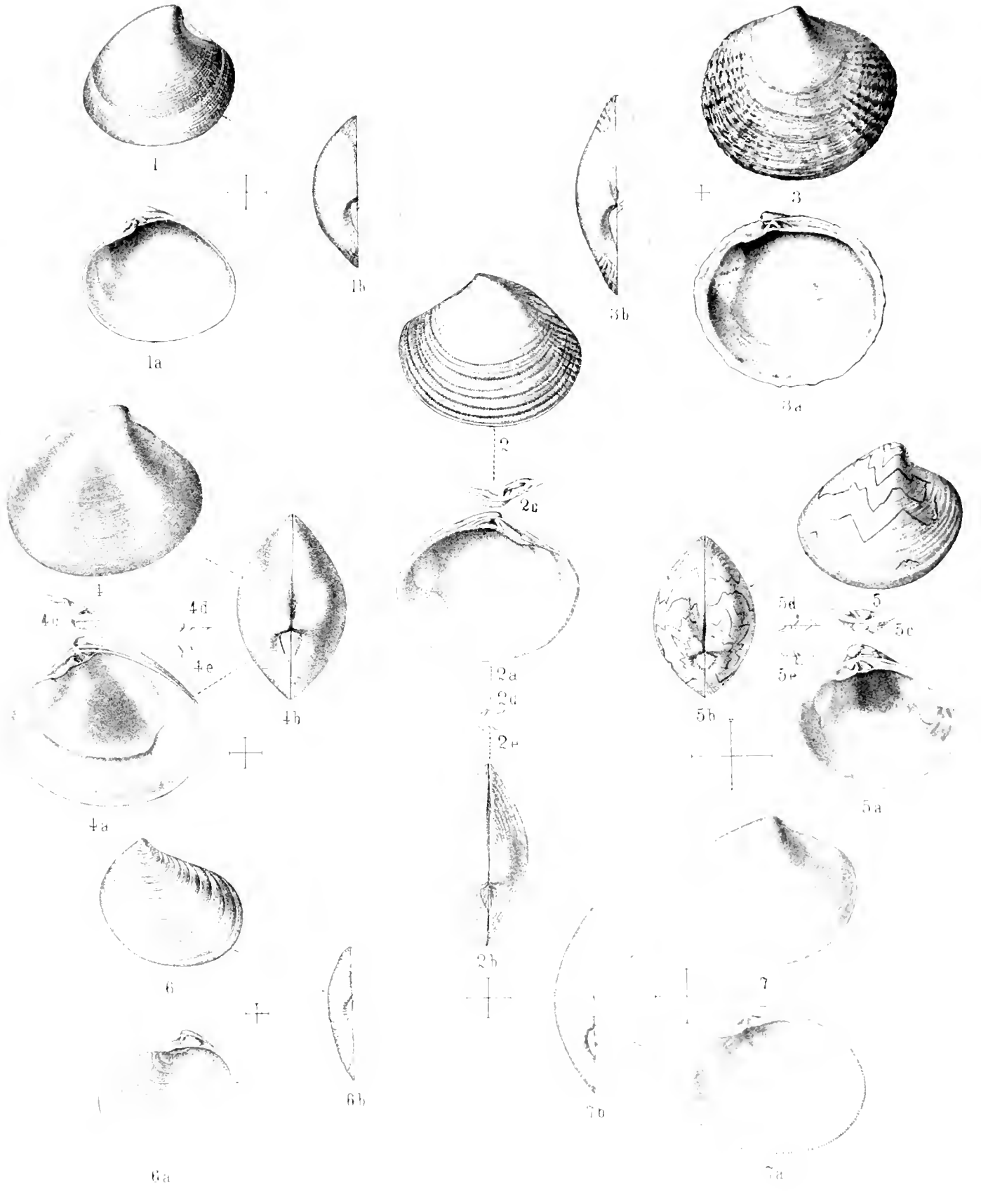
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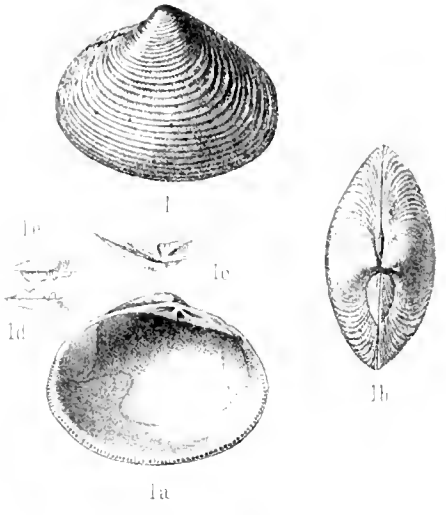
PLATE III.

PLATE III.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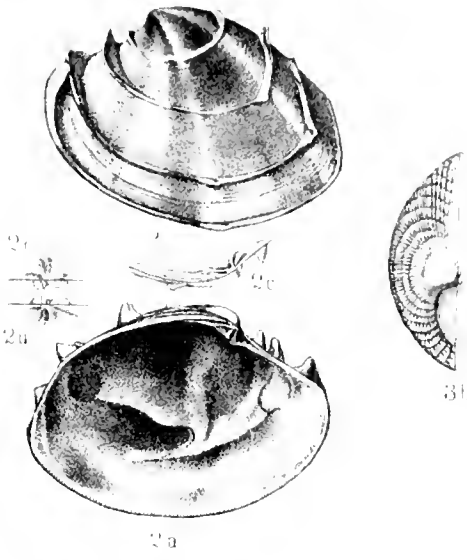
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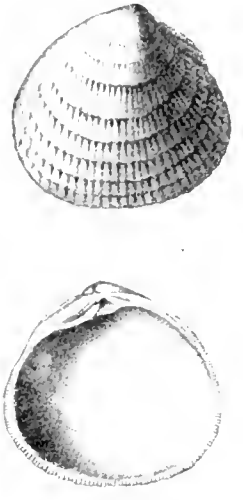
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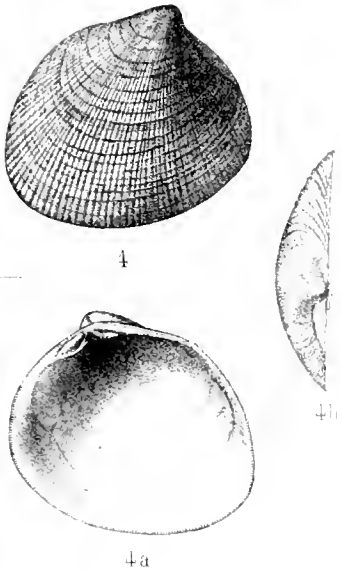
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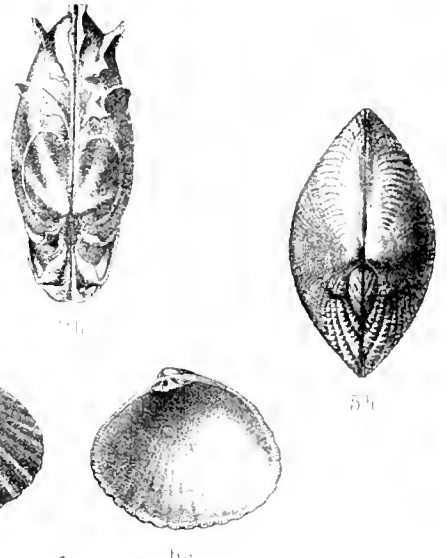
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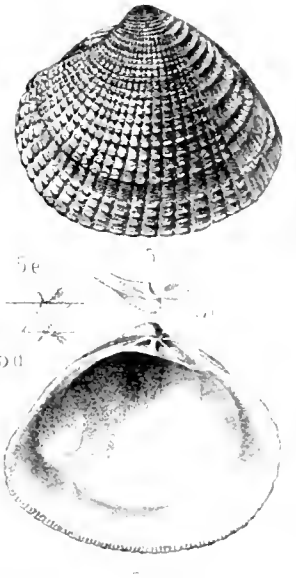
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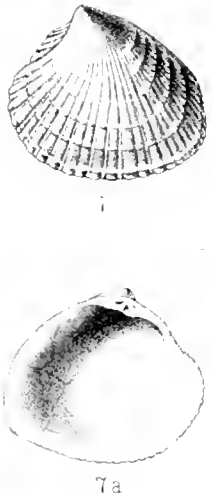
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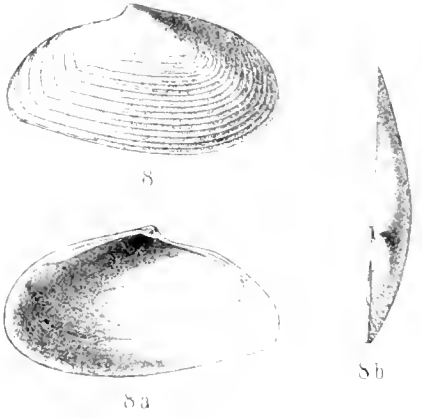
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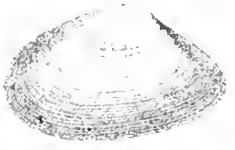

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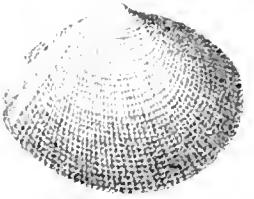

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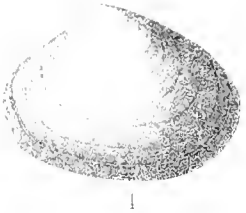

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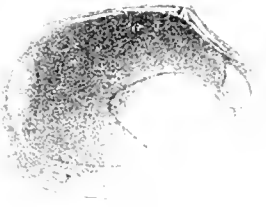

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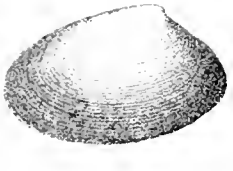

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PLATE V.

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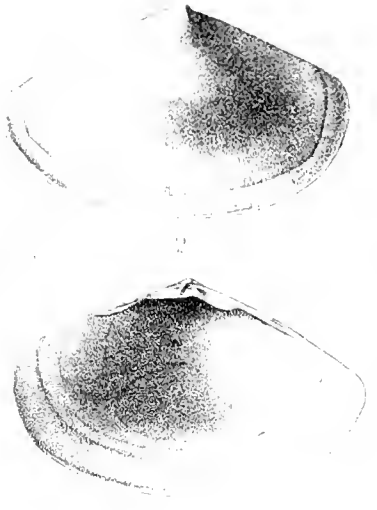

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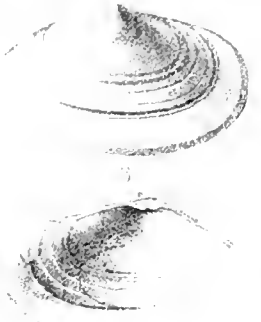

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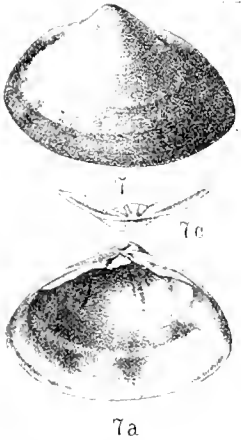

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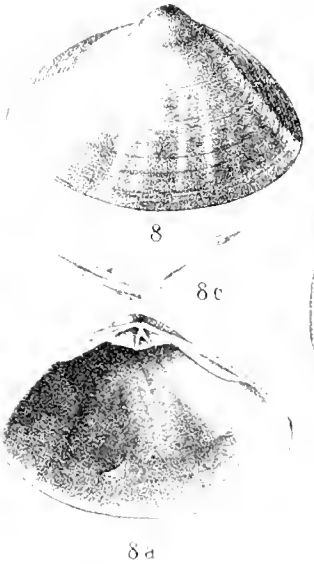

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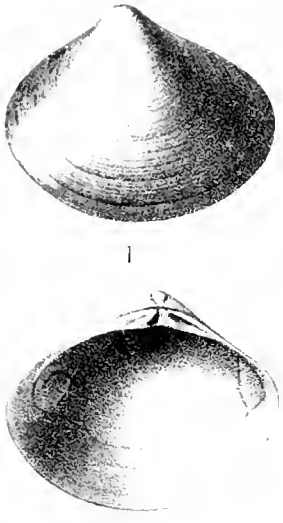
PLATE VI.

PLATE VI.



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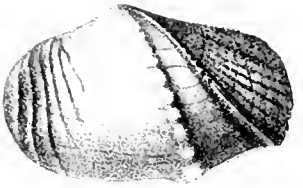

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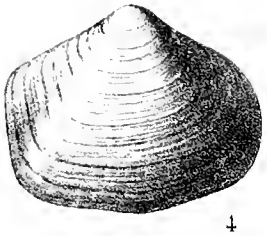

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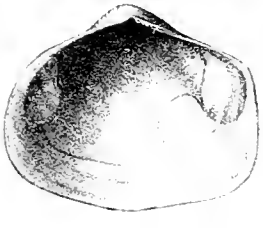

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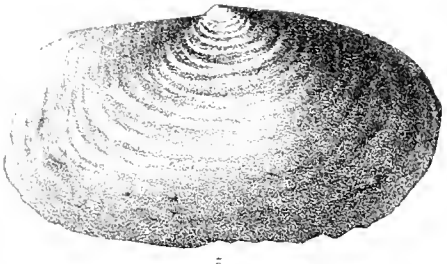
4b



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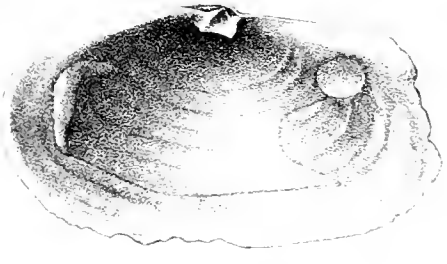

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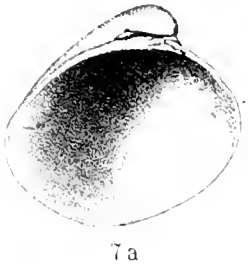
5b

6

6a

6b

7



7a

7b

8

8a

8b

9

9a

9b

PLATE VII.

PLATE VII.

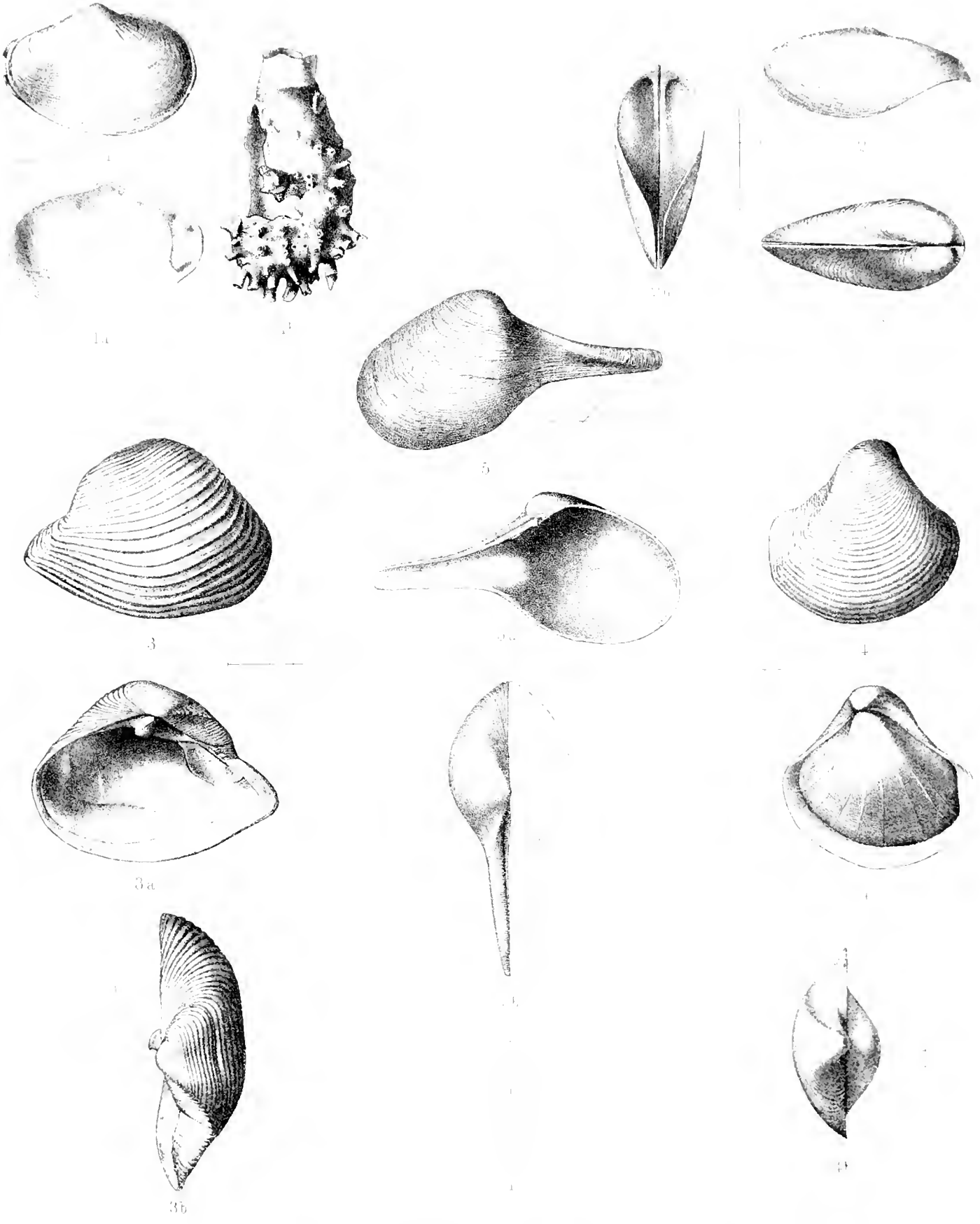


PLATE VIII.

PLATE VIII.

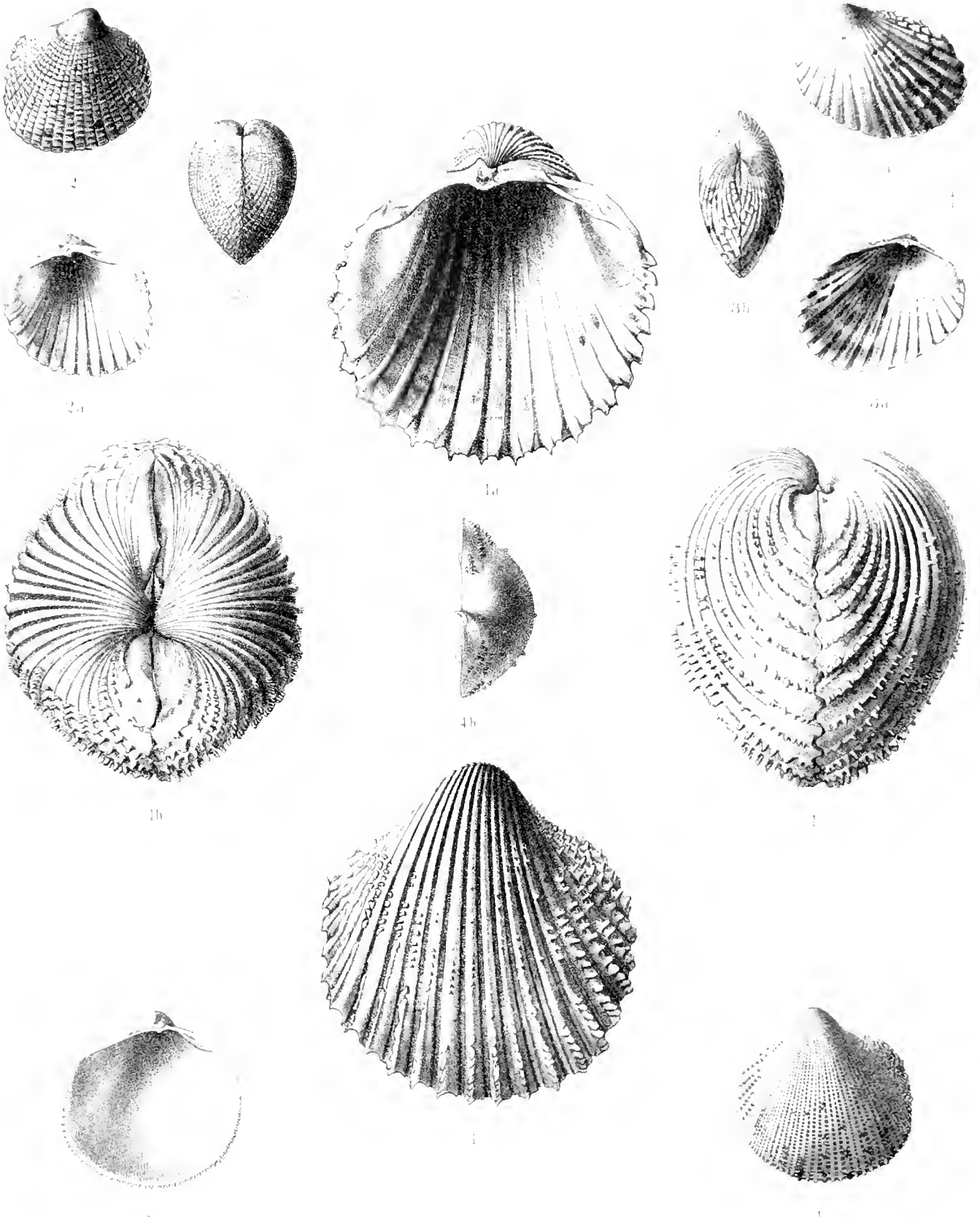


PLATE IX.

PLATE IX.

1

1b

1a

2a

3

4

4b

5a

5

6a

6

7

7b

8

8a

9a

9

10

10b

11

11a

12a

12

PLATE X.

PLATE X.

1

1b

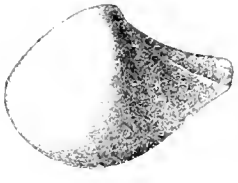
1a

4

2

2b

2a



3

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3b

3a

5a

4b

6

8

7

6a

6b

7a

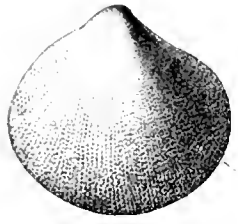
7b

8a

8b

PLATE XI.

PLATE XI.



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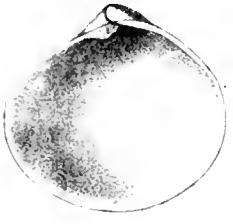
2b



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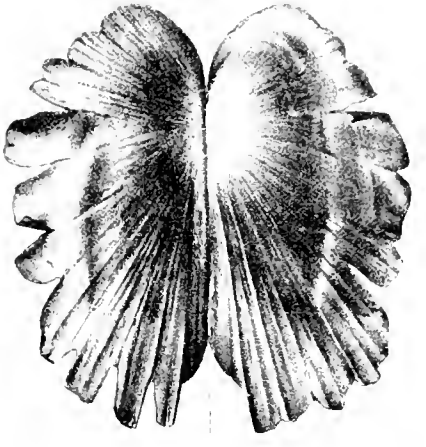
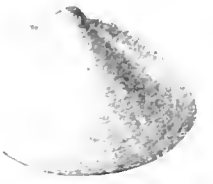


1



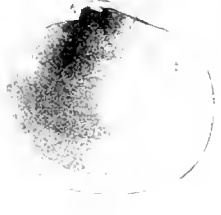
3

3b

3a

5

5b



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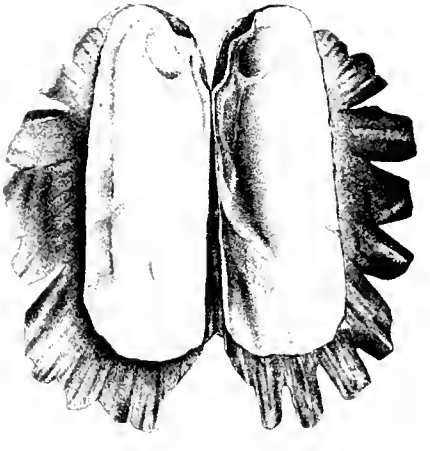
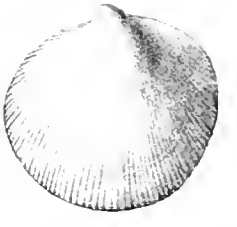


1a



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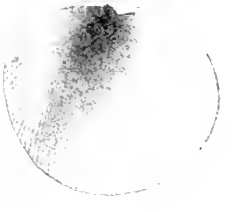
6b



6a

4a

4

4b

PLATE XII.

PLATE XII.

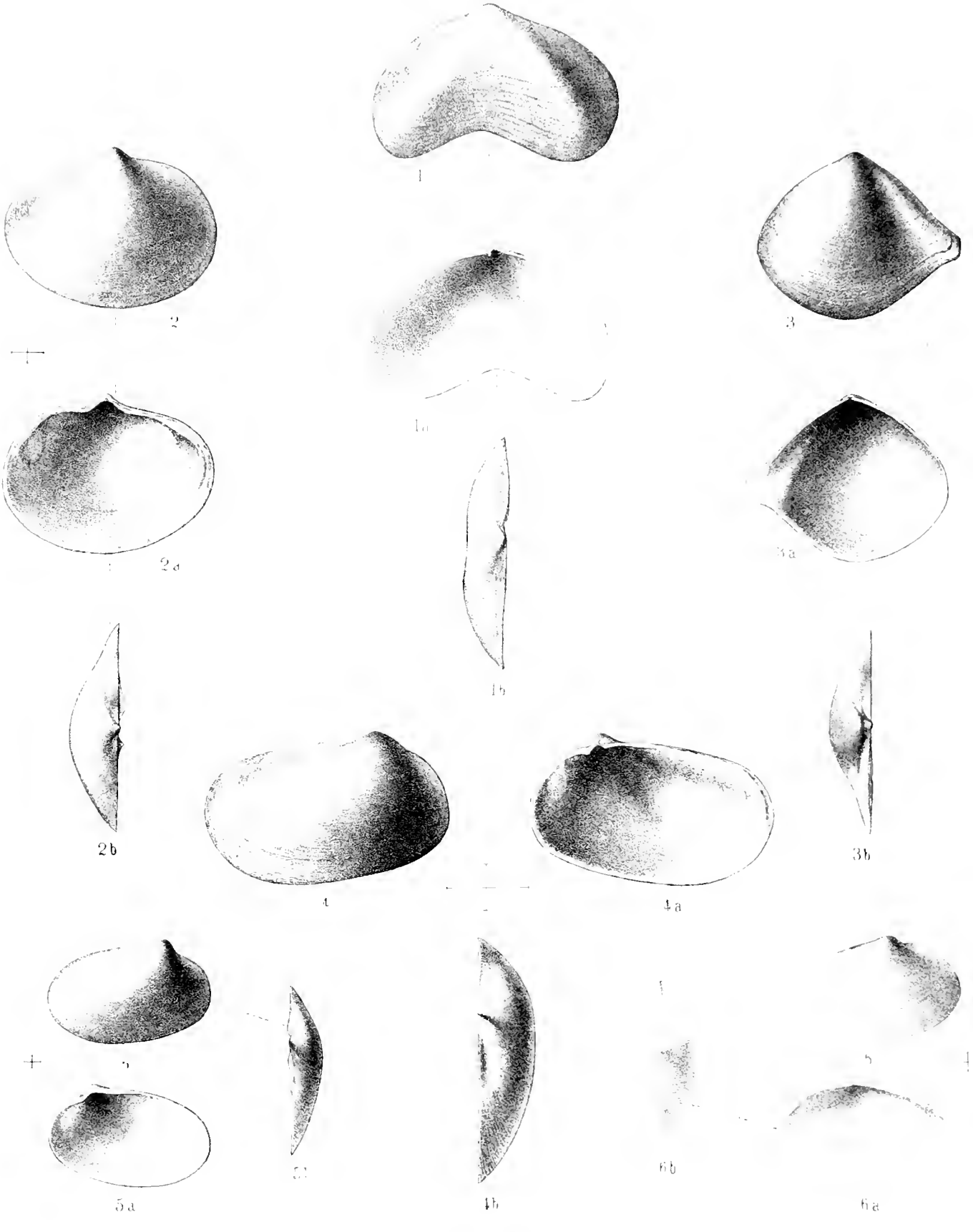
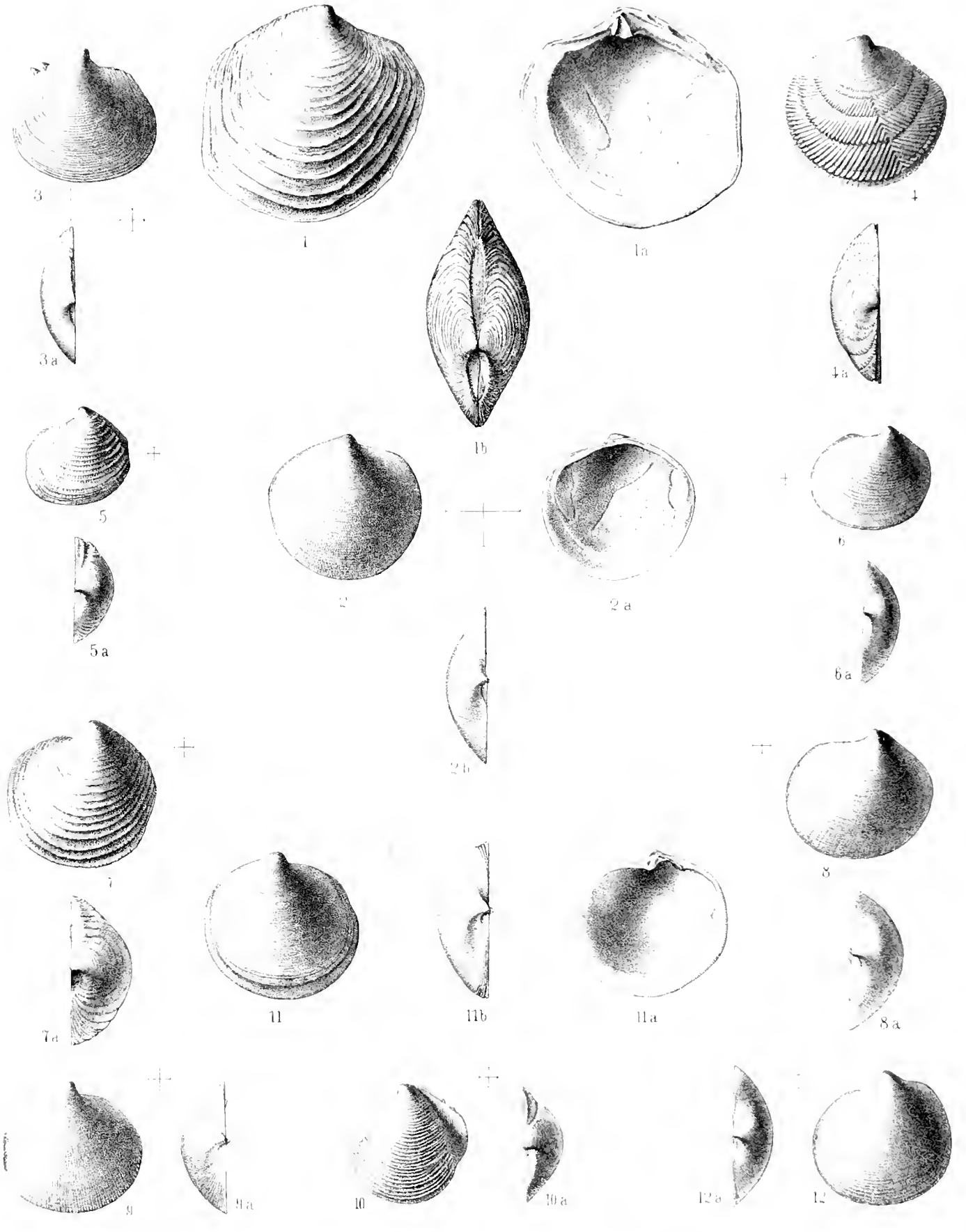


PLATE XIII.

PLATE XIII.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1b
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4a
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5a
2
2a
2b
6
6a
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7a
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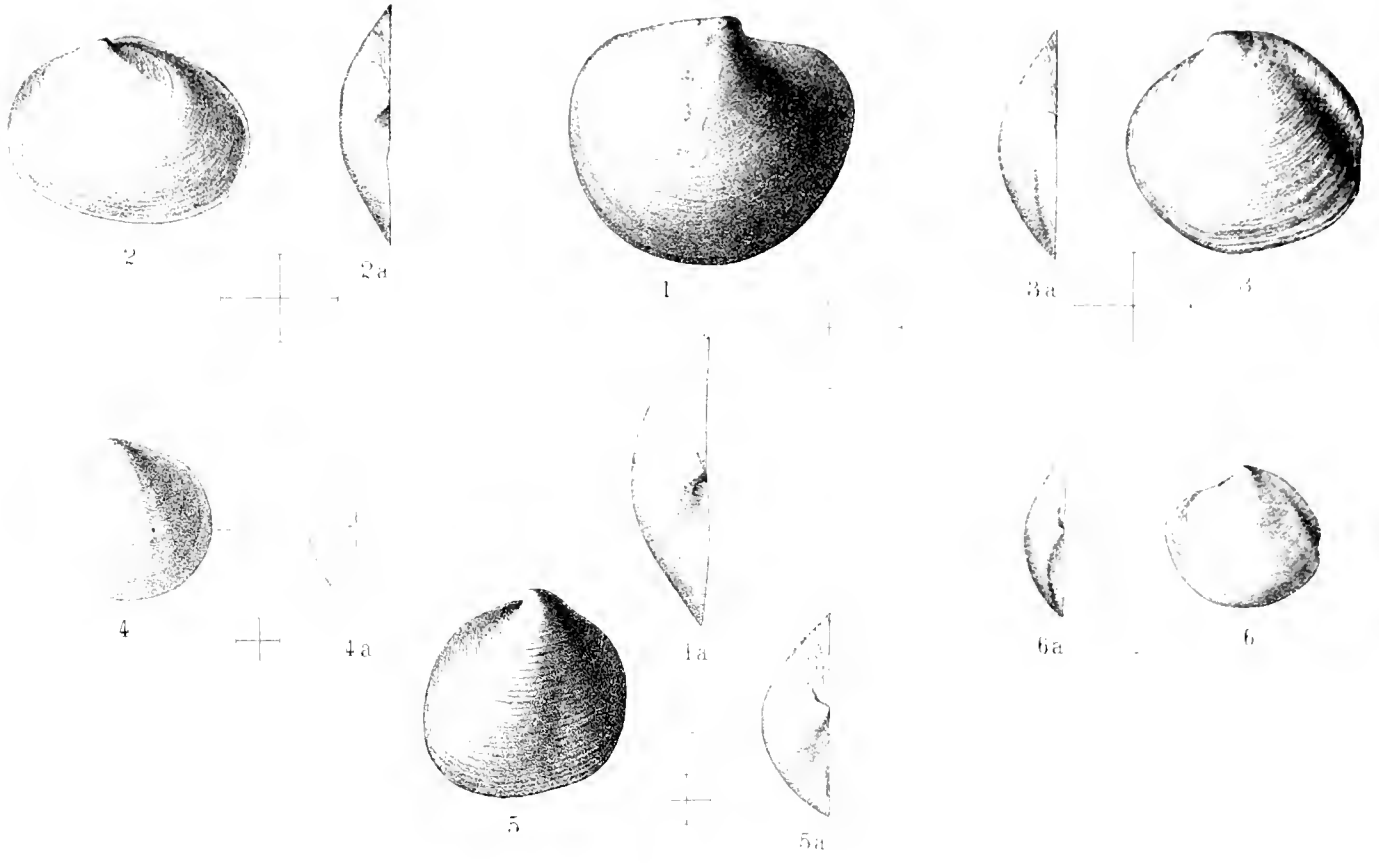
11b
11a
8
8a
9
9a
10
10a
12a
12

PLATE XIV.

PLATE XIV.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3a
3
4
4a
1a
6a
6
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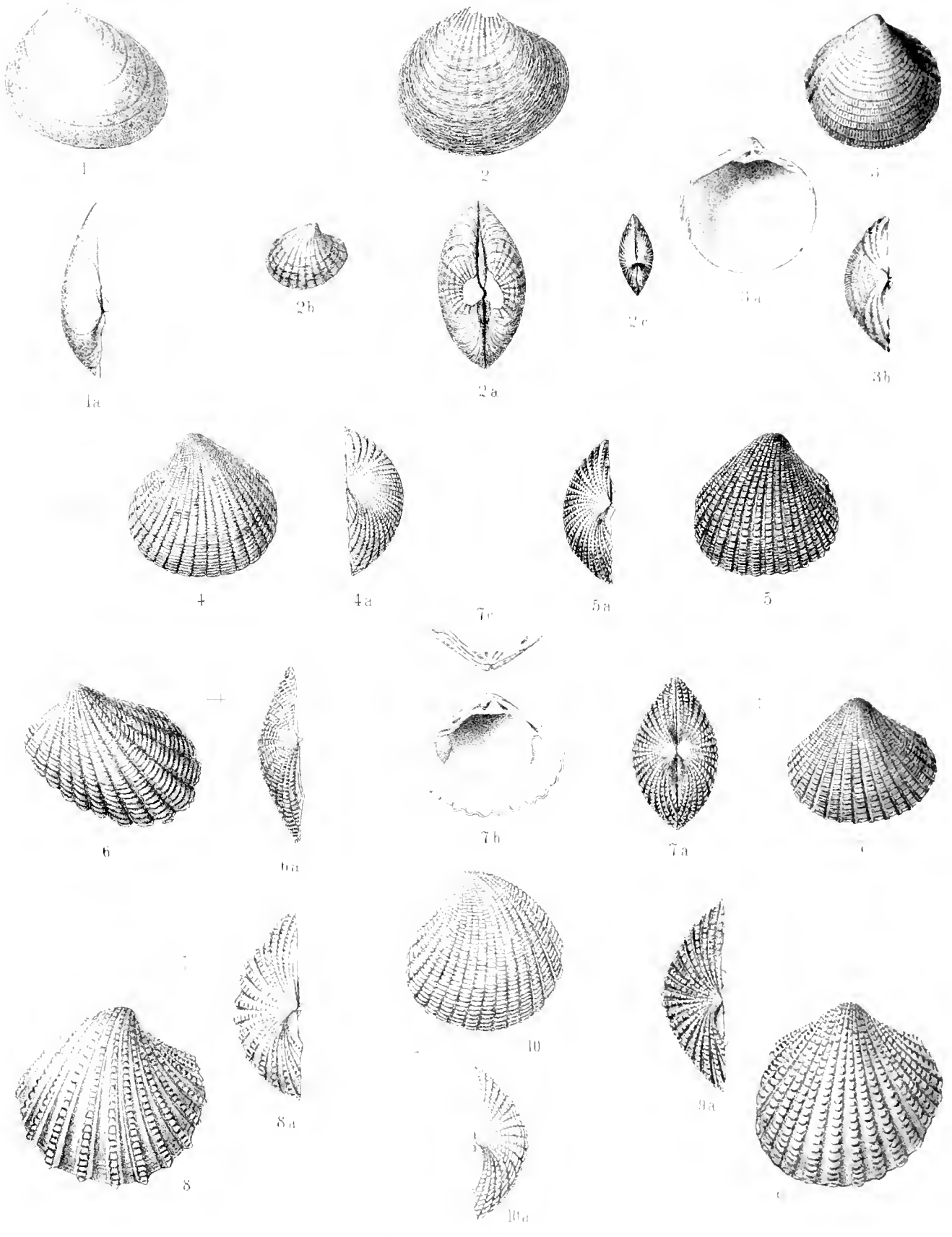
7
7a
11
11a
12a
12

PLATE XV.

PLATE XV.


1
2
3
1a
2b
2a
2c
3a
3b
4
4a
5a
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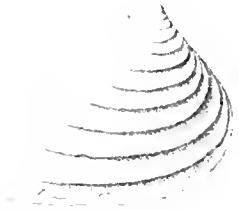
7c
6
6a
7b
7a
8
8a
10
9a
10a

PLATE XVI.

PLATE XVI.



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2

3

2a

4

4a

5a

5

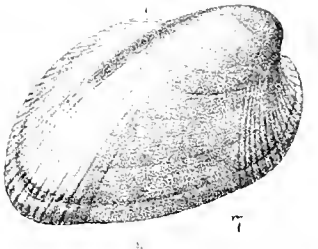
7a

5c

5b

6

6a



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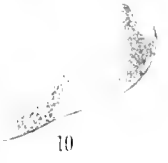
8

9

9a

9b



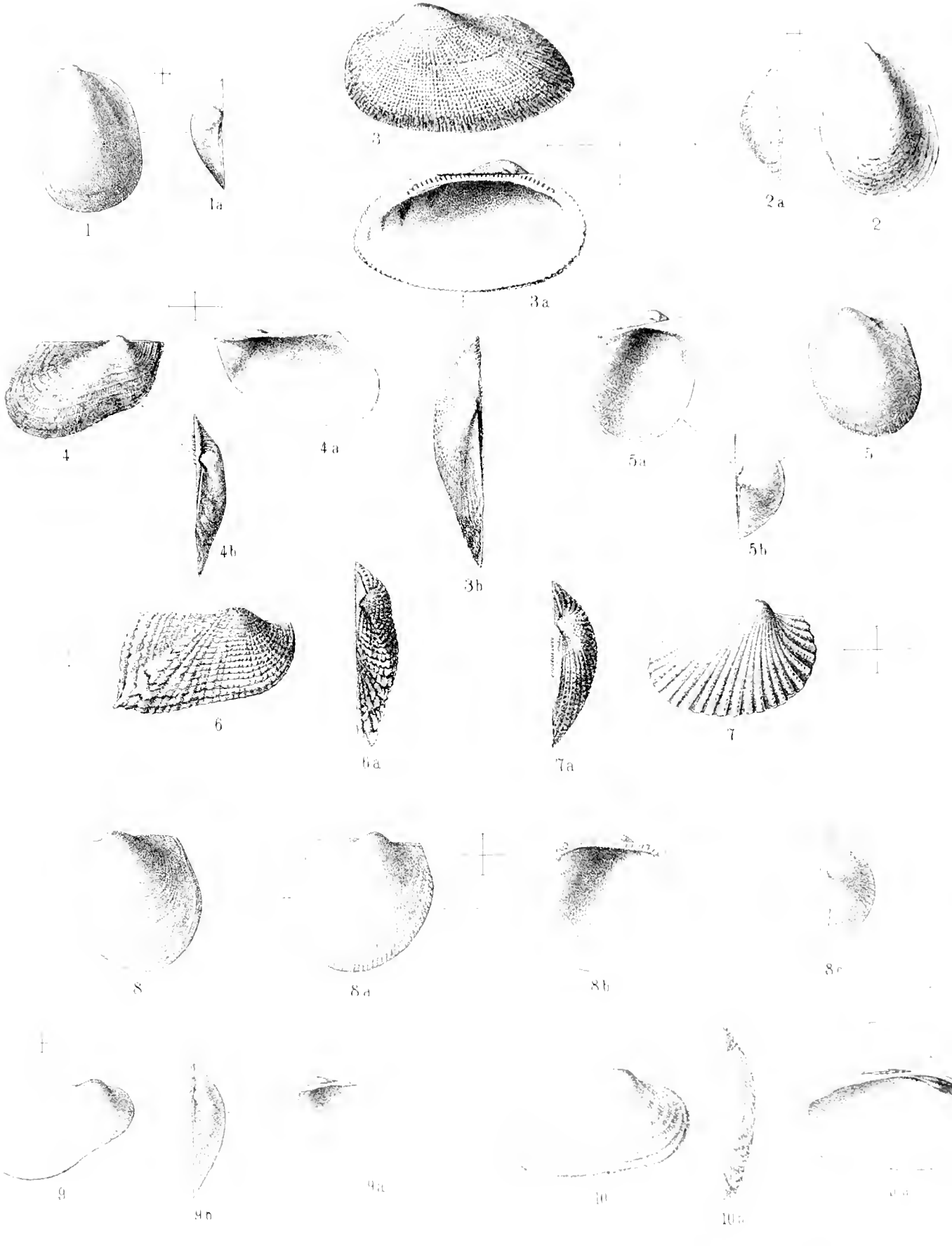
10

10b

10a

PLATE XVII.

PLATE XVII.


1
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3
3a
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2
4
4a
4b
3b
5a
5
5b
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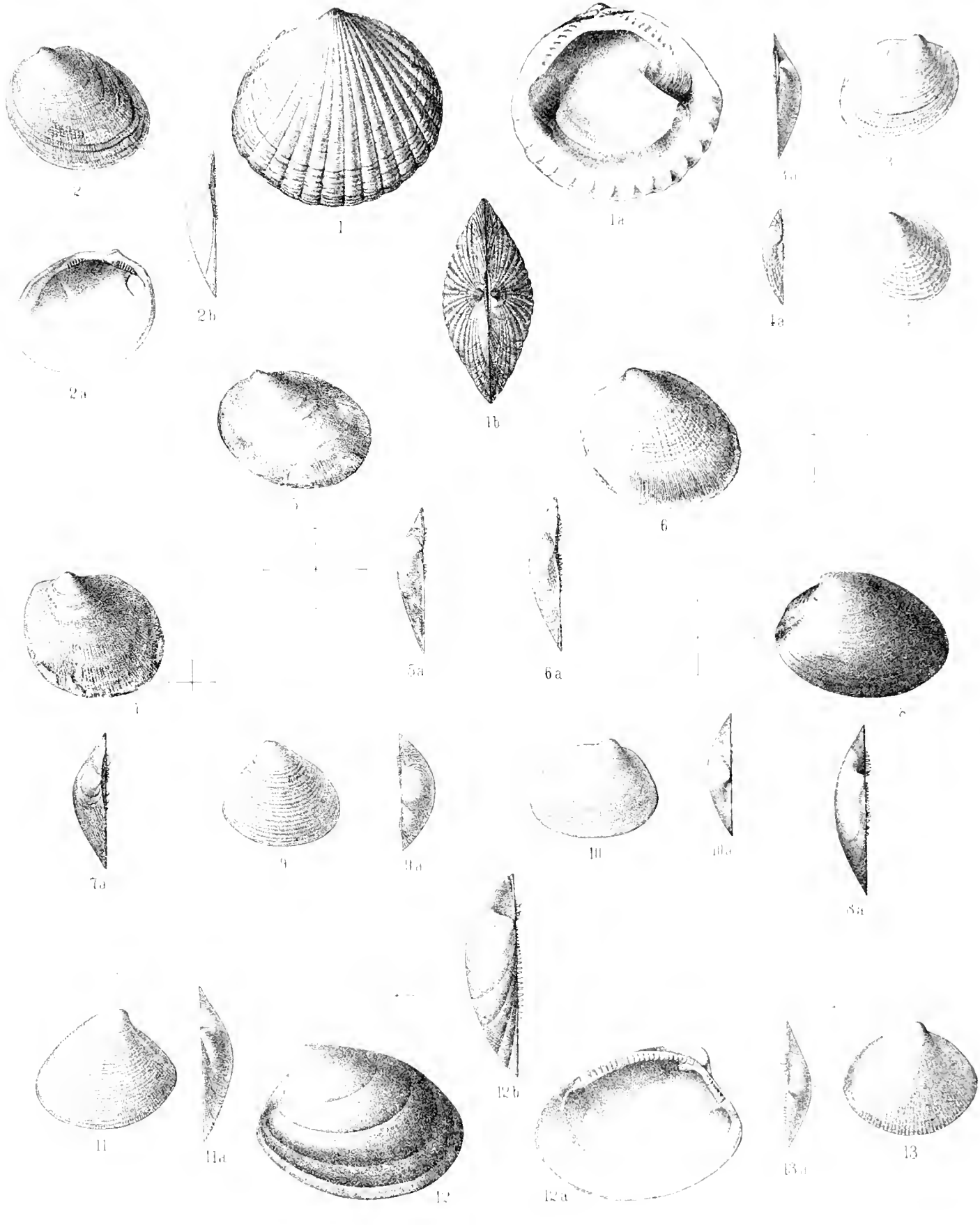
8a
8b
8c
9
9a
9b
10
10a

PLATE XVIII.

PLATE XVIII.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6
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6a
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7a
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9a
10
10a
8a
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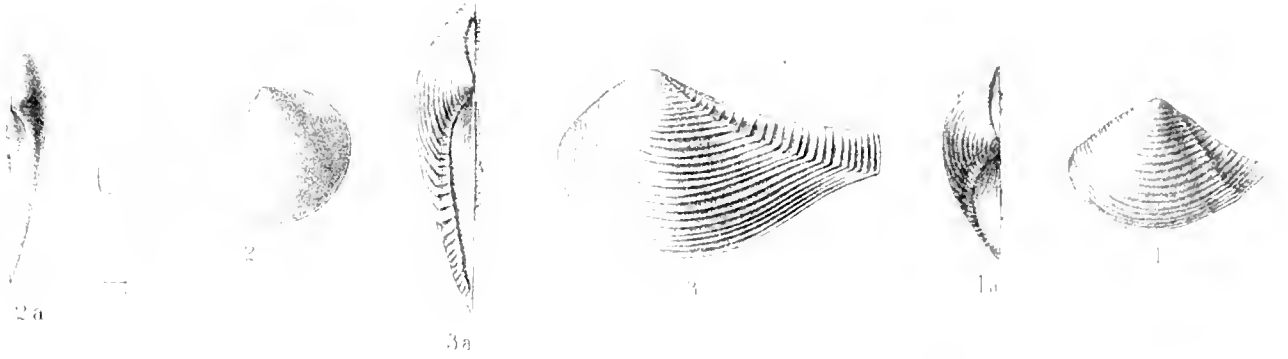
11a
12
12b
12a
13a
13

PLATE XIX.

PLATE XIX.

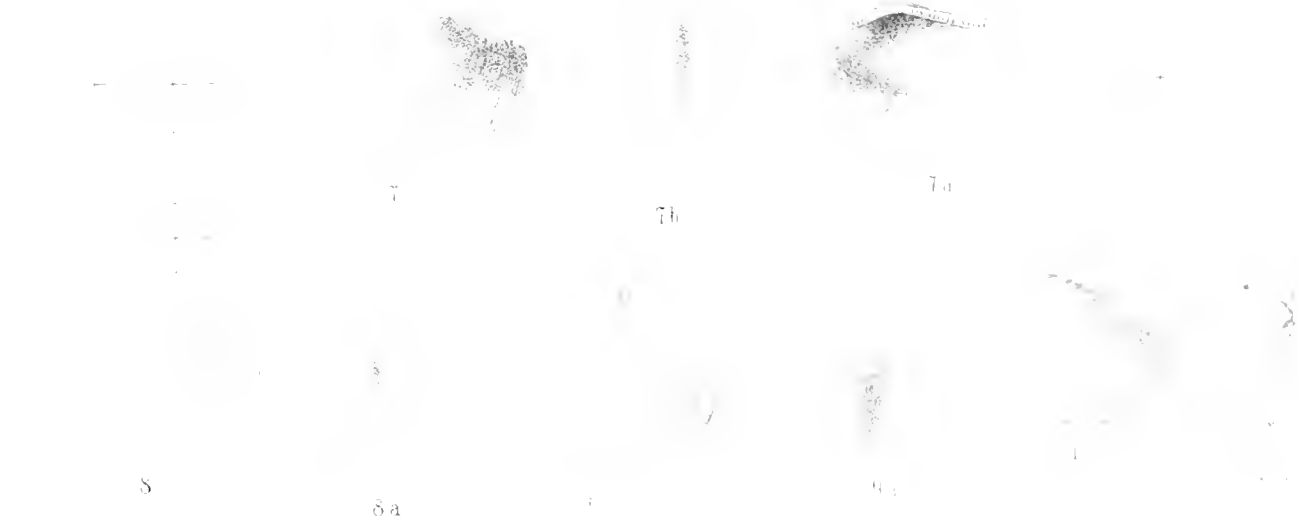
PLATE XX.

PLATE XX.



2a 2 3a 3 1a 1

4 1a 5 6 5b 6b 5a 6a



7 7b 7a 8 8a 9 9a

PLATE XXI.

PLATE XXI.


1
1b
1a
2
2b
2a
4
3
3b
3a
4a
5
5a
4b
6
7
7a
8
8a

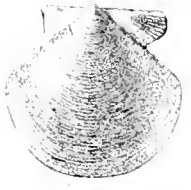
PLATE XXII.

PLATE XXII.

1

1a

2



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4

5

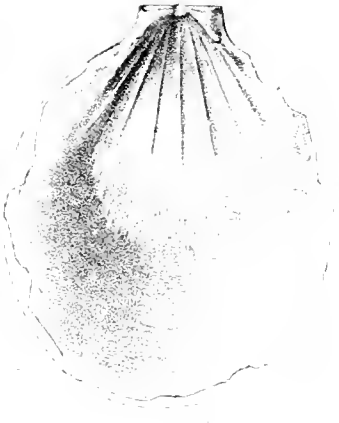
3a

4a

5a

6a

7



7a

8

8a

7b

7c

8b

8c

PLATE XXIII.

PLATE XXIII.

1

1a

1b

1c

2

2a

2b

2c

3a

3

3b

4a

4

4b

5

7a

6

5a

7

7b

6a

8

8a

8b

8c

PLATE XXIV.

PLATE XXIV.

1

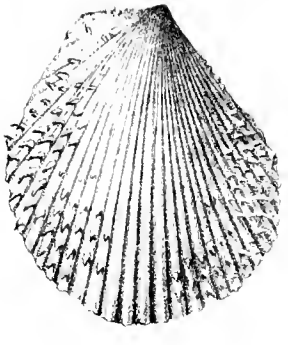
1a

2

2a

2b

2c



3

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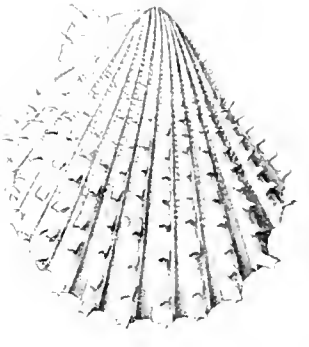
4a



4

5

6

6a

7a

7

5a

8

8a

8b

PLATE XXV.

PLATE XXV.


1
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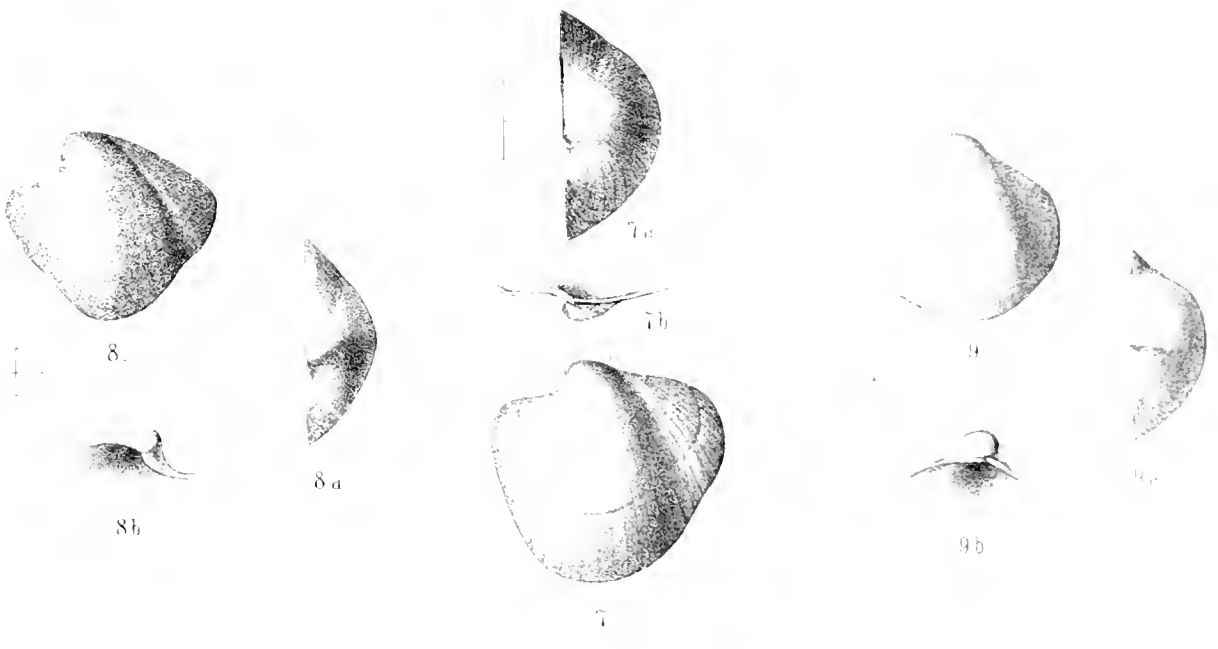
2a
2b
3
3b


4
4a
4b
5
5a
5b
6
6a
6b


7
7a
7b
8
8a
8b
9
9a
9b

THE

VOYAGE OF H.M.S. CHALLENGER.

ZOOLOGY.

REPORT on the GEPHYREA collected by H.M.S. Challenger during the Years 1873–76. By Dr. EMIL SELENKA, Professor in the University of Erlangen.

INTRODUCTION.

AMONG the Gephyrea collected during the Challenger Expedition, many different genera are represented, but the number of species is comparatively small. The twenty-eight species to be afterwards discussed are distributed over eleven genera, and these already known. Two of these genera were indeed described as new by the late R. von Willemoes-Suhm in his letters published in the Zeitschrift für wissenschaftliche Zoologie and in his manuscript notes. But an examination of the original specimens has shown that one of these is really a *Bonellia*, and the other, designated *Leioderma*, n. gen., by v. Willemoes-Suhm, a true *Phymosoma*. The latter species, along with some other more or less damaged specimens, must, moreover, be excluded from our description, since their state of preservation was not such as to admit of an accurate diagnosis of their specific characters. None of them, however, exhibited any important peculiarities.

The habitat and distribution of some of the species are of special interest. Some forms which had previously been found only near the shore, were on the Challenger Expedition dredged from very considerable depths. One new deep-sea species was found in the Pacific and also in the North Atlantic Ocean, and in regard to other forms the range of distribution was shown to be much wider than had hitherto been recognised.

If one may venture to draw general conclusions from the scanty material at our disposal, it appears probable that the tube-inhabiting Gephyrea (genus *Phascolion* and many species of *Phascolosoma*) occur especially in the greater depths, where as yet there has been found only a single example of the free-living forms of the genus *Phymosoma*.

This difference in the distribution of these allied genera seems to be associated with differences in temperature. The eighteen known species of *Phymosoma* are almost exclusively tropical or subtropical forms,[1] occurring only at moderate depths or near shore, and therefore in water comparatively warm. Now, since the temperature of the deep sea is on the whole strikingly low, the almost total absence of forms of *Phymosoma* in these depths may be conditioned by the lack of the requisite warmth. On the other hand, the great majority of the tube-inhabiting forms belonging to the genera *Phascolosoma* and *Phascolion* were found in the waters of the temperate and cold zones, and in the deep sea, while several species of the same genera are also tropical.

In describing the various species I have given references to the more important literature of the subject. In regard especially to the *Gephyrea achæta*, I would mention my recent monograph on the *Sipunculi*.[2]

Synopsis of the Genera and Species.

A. Gephyrea chætifera.

Genus 1. *Sternaspis*, Otto.

1. *Sternaspis princeps*, n. sp.

Genus 2. *Echiurus*, Guérin.

2. *Echiurus unicinctus*, v. Drasche.

Genus 3. *Thalassema*, Gaertner.

3. *Thalassema fusca*, n. sp.
4. *Thalassema baronii*, Greeff.

Genus 4. *Bonellia*, Rolando.

5. *Bonellia suhmii*, n. sp.

B. Gephyrea achæta.

Genus 5. *Phascolosoma*, F. S. Leuckart (*s. str.* Selenka and de Man).

(*a*) Proboscis with four retractors. Hooks present.

6. *Phascolosoma vulgare*, de Blainville.
7. *Phascolosoma vulgare*, var. *astuta*, nov.
8. *Phascolosoma pudicum*, n. sp.

[1] We have an exception in the *Phymosoma granulatum* of the Mediterranean, which is most closely allied to the *Phymosoma scolops* of the Red Sea and Pacific and Indian Oceans, and which has doubtless found its way from the Red Sea into the Mediterranean.

[2] Die Sipunculiden, eine systematische Monographie, unter Mitwirkung von Dr. J. G. de Man and Dr. C. Bulow bearbeitet von Dr. Emil Selenka; in Semper's Reisen im Archipel der Philippinen, Theil. II. Bd. iv. Abth. 1, also separately, Wiesbaden, 1883.

(*b*) Proboscis with four retractors. Hooks absent.

9. *Phascolosoma capense*, Teuscher.

(*c*) Proboscis with two retractors. Hooks absent.

10. *Phascolosoma prioki*, Shiter.
11. *Phascolosoma catharinæ*, Fritz Müller.
12. *Phascolosoma flagriferum*, n. sp.

Genus 6. *Dendrostoma*, Grube.

13. *Dendrostoma blandum*, Selenka and de Man.

Genus 7. *Phascolion*, Théel (Selenka and de Man).

14. *Phascolion squamatum*, Koren and Danielssen.
15. *Phascolion lutense*, n. sp.
16. *Phascolion tubicola*, Verrill.
17. *Phascolion botulus*, n. sp.
18. *Phascolion strombi* (Montagu).

Genus 8. *Aspidosiphon*, Grube.

19. *Aspidosiphon speculator*, n. sp.
20. *Aspidosiphon truncatus*, Keferstein.

Genus 9. *Phymosoma*, Quatrefages (Selenka and de Man).

21. *Phymosoma japonicum*, Grube.
22. *Phymosoma scolops*, Selenka and de Man.

Genus 10. *Sipunculus*, Linné.

23. *Sipunculus nudus*, Linné.

C. Appendix.

Genus 11. *Chætoderma*, Lovén.

24. *Chætoderma militare*, n. sp.

DESCRIPTION OF GENERA AND SPECIES.

Order GEPHYREA.

Annelids with degenerated segmentation, without external jointing, without parapodia, and without dorsal gills. There is a closed vascular system, and one to three (rarely six) pairs of segmental organs. There are seldom numerous setæ, and in most species none. The sexes are separate. Found in all seas.

A. Gephyrea chetifera.

Gephyrea with setæ.

Genus 1. *Sternaspis*, Otto.

The body is indistinctly segmented, and there are bundles of setæ both anteriorly and posteriorly. The ventral surface is smooth, and at the posterior end there is a shield, the borders of which are provided with setæ. The anterior end of the body bears a long forked proboscis. Anus at the posterior end, and beside it numerous retractile gill-filaments (Kiemenfäden). Found in all seas.

Since Sluiter found a long forked proboscis in the East Indian *Sternaspis spinosa*, Sluiter, we are probably justified in assuming the presence of a similar proboscis in the other species of the genus, although it has as yet been observed only in that one. Sluiter himself reports, indeed, that the proboscis is always thrown off by the animal a few minutes after its capture.

It does not seem to be beyond question whether the form preserved in the Challenger collection can be regarded as really the representative of a distinct species. All the species of *Sternaspis* as yet known are very like one another, and our *Sternaspis princeps* is only distinguished by subordinate characters, on the one hand from *Sternaspis spinosa*, Sluiter, from Batavia, and on the other from the *Sternaspis costata* of Marenzeller, from the Bay of Miya. The imperfect preservation of the Challenger specimen unfortunately does not admit of any intimate description of the anatomical structure.

1. *Sternaspis princeps*, n. sp. (Pl. I. fig. 1).

Along the middle of the ventral surface there runs a shallow furrow, and each half is divided by a diagonal keel into an anterior larger and a posterior smaller triangle. There are forty tufts of setæ on the margin of the shield. The whole body is studded with fine scattered chitinous setæ, each having at its base a number of smaller chitinous pieces grouped together into a small wart-like protuberance.

Of the two specimens preserved the larger is represented in fig. 1.

Habitat.—Station 169, July 10, 1874; lat. 37° 34′ S., long. 179° 22′ E.; depth, 700 fathoms; bottom temperature, 40°·0; blue mud; trawled.

Genus 2. *Echiurus*, Guérin.

The proboscis has a deep furrow, but is not split in front. There are two anterior ventral hooked setæ, and one or two circles of posterior bristles. Two pairs of segmental organs, two internal anal vesicles (Analkiemen) with ciliated funnels.

2. *Echiurus unicinctus*, von Drasche (Pl. I. fig. 2; Pl. III. figs. 11, 12).

> *Echiurus unicinctus*, von Drasche, Ueber eine neue *Echiurus*-Art aus Japan, &c., Verhandl. d. k. k. zool.-bot. Gesellsch. Wien, Bd. xxx. pp. 621–628, Taf. xxx. fig. 1, Jahrg. 1880, 1881.

Short proboscis. There is only one circle of posterior bristles. The paired appendages of the segmental organs are long and spirally coiled.

Out of twenty-one specimens the average length was 7 cm. and the breadth about 15 mm. The largest was 9½ cm. long. All were much contracted. The grooved proboscis is not very sharply distinguished from the body, it has a conical form and is very short, not exceeding 6 mm. in its contracted state. The papillæ on the skin measure from 0·2 to 0·5 mm., and look like numerous little knots. They are not arranged in transverse rows except at special places, as for example close beside the ventral setæ. The preserved specimens are of a bright yellowish-brown colour. Immediately behind the base of the proboscis on either side of the median ventral line are the two moderately strong hooked setæ. At the posterior end of the body there is an anal region bordered by a single circle of golden stylet-like setæ, bent slightly outwards. In most of the specimens there were eleven of these setæ, but in some nine, ten, twelve, or thirteen. As in the other species of *Echiurus*, the circle of setæ exhibited a distinct gap on the ventral surface. Here and there reserve setæ may be seen. In regard to the musculature, it may be noted that the internal layer of circular muscles consists of about

two hundred bands repeatedly anastomosing. The alimentary canal consists of a pharynx, a narrow muscular œsophagus, an intestine with three main loops, which after forming a small cæcum is continued into a wide rectum terminating in the cloaca. Each loop of the intestine is attached to the body-wall by special muscles, which frequently broaden out into a fan-shape as they approach the intestine. The strands attaching the rectum ("Befestiger") are especially numerous (sixty to seventy). As regards the vascular system, two vessels admit of ready recognition, one dorsal accompanying the alimentary canal, and one ventral lying above the nerve-cord. Like v. Drasche I was unable to discover any trace of a vascular ring. Both pairs of segmental organs have associated with them near their external opening two spirally coiled appendages like those which occur in most species of *Thalassema*, where Greeff has described them under the designation "spiral tubes." They are also described and figured by v. Drasche. The anal vesicles are in structure like those of *Echiurus pallasii*.

Some of the specimens were so well preserved that a detailed representation of the ciliated funnels was in some cases possible (Pl. III. figs. 11, 12).

Habitat.—Inland Sea, Japan. From fishermen, May 28, 1875.

Von Drasche notes that in both the specimens which he examined the proboscis (Kopflappen) was wanting. Careful investigation, however, has convinced me that the short process at the anterior end of the body really represents the *whole* proboscis. It is quite likely then that even in von Drasche's specimens the proboscis was present and complete.

This species was first mentioned by Willemoes-Suhm[1] in the following terms:—"A new Echiurid from the Japanese coast, used by the fishermen as bait, and occurring in the mud close by the shore. The worm measured 3 to 4 inches in length, and in all its characters resembled the genus *Echiurus* except in having a single posterior circle of setæ instead of two."

Genus 3. *Thalassema*, Gaertner.

Body swollen with a short undivided proboscis. Two internal anal vesicles, usually with ciliated funnels. Only two anterior ventral hooked setæ. There are one to six pairs of (anterior) segmental organs.

3. *Thalassema fusca*, n. sp. (Pl. III. fig. 13).

The longitudinal musculature is undivided. There is only a single pair of segmental organs. The proboscis is small. The thin skin of the preserved specimen is whitish and smooth, the papillæ are indistinct and scattered. The intestine exhibits the usual charac-

[1] Brief VII. an C. Th. von Siebold, *Zeitschr. f. wiss. Zool.*, Bd. xxvii. p. cii., 1876.

teristics. The anal vesicles are of moderate size, with irregularly distributed cæcal appendages, some of which are simple and others much branched, and which seem usually to bear at their apex only a single minute ciliated funnel. In front of the external openings of the segmental organs are two small hooked setæ. There is only a single pair of segmental organs, which have at their extremity a folded and wrinkled vesicle.

There was only a single contracted specimen about 40 mm. long and 15 mm. broad.

Habitat.—H.M.S. "Porcupine," Station 77, 1869; lat. 60° 34′ N., long. 4° 40′ E.; 560 fathoms.

In some other species, namely in *Thalassema möbii*, Greeff,[1] and *Thalassema vegrande*, Lampert,[2] the longitudinal musculature consists, as in this case, not of a number of separate strands, but of a continuous sheath. These two species above mentioned, however, possess three pairs of segmental organs, and are therefore readily distinguishable from *Thalassema fusc.* A single pair of segmental organs is characteristic only of the latter and of *Thalassema gigas*, Max Müller, which was found at Trieste, and is not identical with this species.

4. *Thalassema baronii*, Greeff.

Thalassema baronii, Greeff, Die Echiuren (Gephyrea armata), Nova Acta Acad. Caes. Leop.-Carol., Bd. xli. pars ii., No. 1, pp. 151, 152, Taf. vi. figs. 63, 64, 1880.

Owing to the imperfect preservation of the single specimen, only a very incomplete examination of the internal organs was possible. The proboscis was torn away. Greeff found the species at Arrecife on the Canary Island Lanzerote, near the shore, among lava blocks and débris. Of the real colour of *Thalassema baronii*, which Greeff describes as dark green with longitudinal stripes of violet, there was no longer any trace in the yellowish-brown specimen of the Challenger Expedition. On the other hand, however, the two forms, found in such different places, agree in the following characters.

The whole body is covered with small papillæ. Each of the two pairs of segmental organs has at its extremity a funnel. The anal vesicles have the form of two long tubes, bearing on their surface short tree-like branches, which to the naked eye look like tufts, and which possess terminal ciliated funnels. The longitudinal musculature of the body-wall is arranged in from twenty to twenty-three strands.

Habitat.—Bahia, September 1873, 7 to 20 fathoms.

The anatomical structure of the Challenger specimen so closely resembles that of Greeff's species that I have no hesitation in identifying the two forms.

[1] R. Greeff, Die Echiuren (Gephyrea armata), *Nova Acta Acad. Caes. Leop.-Carol.*, Bd. xli. pars ii., No. 1, p. 152, 1880.

[2] K. Lampert, Ueber einige neue Thalassemen, *Zeitschr. f. wiss. Zool.*, Bd. xxxix. p. 341.

Genus 4. *Bonellia*, Rolando.

Body swollen. Proboscis much elongated and forked at the apex. There are only two anterior hooked setæ. Two internal anal vesicles with ciliated funnels; only a single anterior segmental organ (the uterus). The male is Planarian-like, without mouth or anus.

5. *Bonellia suhmii*, n. sp. (Pl. I. fig. 3; Pl. II. figs. 4–6).

In fig. 3 is reproduced the original sketch of Willemoes-Suhm. His manuscript notes on the internal structure of this form are not quite correct. He erred by mistaking mouth for anus, and *vice versa*.

Anatomical investigation has demonstrated that this form, which was described in v. Willemoes-Suhm's notes as a new genus, is really a true *Bonellia*. It must be confessed that both the posterior end of the body and the proboscis were torn away from the specimen, that the hooked setæ were not to be found, that the intestine was only partially present, and, in general, that the internal organs were much injured and torn. Yet from the following description it will be seen that we have here undoubtedly to do with a true *Bonellia*.

Fig. 3 on Pl. I. displays the single specimen in its natural size. The dermal muscular sheath was for the most part relaxed anteriorly, and much contracted posteriorly. Over this posterior portion the external skin seemed to be covered by irregularly distributed warts. Of the internal organs the following were preserved (Pl. II. fig. 4): —the anterior portion of the alimentary canal (torn away at *y*), the œsophageal nerve-ring and ventral cord (*n*), the uterus (*u*), with its ciliated funnel, and the two anal vesicles (Σ, Σ), of which the anterior portion is slightly enlarged in fig. 6.

The uterus (fig. 5) was filled with about sixty eggs, which exhibited the characteristic structure of the ripe eggs of the Mediterranean *Bonellia*. The male was not to be seen either in the œsophagus or in the uterus.

Habitat.—Station 47, May 7, 1873; lat. 41° 14′ N., long. 65° 45′ W.: depth, 1340 fathoms, off Nova Scotia; blue mud; dredged.

I have taken this opportunity of giving a figure of the male *Bonellia viridis*, Rolando, more complete than hitherto (see Pl. II. figs. 7–10).

The males of *Bonellia* were, as is well known, first described by A. Kowalevsky[1] as Planarian-like parasites in the uterine portion of the female genital duct.

The discovery of the Russian embryologist was confirmed by Catta and Marion,[2] and

[1] A. Kowalevsky, *Schriften d. naturf. Gesellsch. zu Kiew*, Bd. v., and also in a French translation under the title Du mâle planariforme de la Bonéllie, *Revue des Sci. Nat.*, t. iv., No. 8, pp. 313–319, pl. vii., 1875.

[2] *Ibid.*

the latter noted on the minute male the presence of two hooks behind the mouth opening. Vejdovsky[1] investigated anew the structure of the male *Bonellia*, and discovered the central nerve-cord, which had till then been overlooked. I then[2] described for the first time the œsophageal nerve-ring, the alimentary canal without mouth or anus, and the two rudiments of the anal vesicles. In a very exhaustive memoir Spengel[3] has given figures and description of the structure of the male *Bonellia*, yet both this naturalist and Greeff have overlooked the rudimentary anal vesicles which I have here figured in Pl. II. fig. 10. After Spengel's excellent description it seems to me unnecessary to enter further into the discussion of the anatomical details, and I therefore simply refer to the figures.

B. Gephyrea achæta.

A. *Gephyrea without setæ.*

Genus 5. *Phascolosoma*, F. S. Leuckart.

The longitudinal musculature is continuous and not divided into distinct bands. There are numerous tentacles arranged in a circle or in groups round about the mouth. The intestine is spirally coiled. The "intestinal spiral" (Darmspira) in the posterior portion of the body quite unattached. Hooks may be absent. There are two free segmental organs. Eggs spherical. Two to four retractors of the proboscis. Found in all seas.

6. *Phascolosoma vulgare*,[4] de Blainville.

Sipunculus vulgaris, de Blainville, Dict. d. Sci. Nat., t. xlix., 1827, pp. 312, 313, Vers., pl. xxxiii. fig. 3.

Syrinx harveyi, Forbes, A History of British Starfishes, London, 1841, p. 249, with woodcut.

Phascolosoma vulgare, Keferstein, Beiträge zur Kenntniss der Gattung Phascolosoma, F. S. Leuckart, Zeitschr. f. wiss. Zool., Bd. xii. p. 39, Taf. iii. fig. 3, 1862; *Ibid.*, Bd. xv. p. 429, Taf. xxxi. fig. 5, 1865.

Phascolosoma margaritaceum, Keferstein, Beiträge zur anatomischen und systematischen Kenntniss der Sipunculiden, Zeitschr. f. wiss. Zool., Bd. xv. p. 530, Taf. xxxi. fig. 9, Taf. xxxii. figs. 28, 29, 1865.

[1] F. Vejdovsky, Ueber die Eibildung und Mannchen von Bonellia viridis, Rol., *Zeitschr. f. wiss. Zool.*, Bd. xxx. pp. 487–500, pl. xxx., 1878.

[2] Em. Selenka, Das Mannchen d. Bonellia, *Zool. Anzeiger*, No. 6, p. 120, 1878.

[3] G. W. Spengel, Beitrage zur Kenntniss der Gephyreen, I. Die Eibildung, die Entwickelung und das Mannchen der Bonellia, *Mittheilungen aus der Zoolog. Station zu Neapel*, Bd. i. Heft. iii. Taf. viii.–xii., 1879.

[4] Strictly speaking the setæ are not always absent. In the young larva of *Phascolosoma vulgare*, for instance, I found three pairs of setæ. These are, however, subsequently thrown off. In the adult animals true setæ seem to be entirely absent. *Vide* Eifurchung und Larvenbildung von Phascolosoma elongatum, *Zeitschr. f. wiss. Zool.*, Bd. xxv. p. 446, Taf. xxx. figs. 14, 15, 18, 1875.

Sipunculus obscurus, Quatrefages, Histoire naturelle des Annelés marins et d'eau douce, t. ii. p. 216, pl. xvi. figs. 16, 17, 1865.

Phascolosoma validum, Théel, Etudes sur les Gephyriens inermes des mers de la Scandinavie, du Spitzberg et du Groenland, Bihang til k. Svenska Vet. Akad. Handl., Bd. iii., No. 6, Stockholm, pp. 7, 8, pl. i. fig. 5, pl. iii. fig. 18, pl. iv. fig. 20, 1875.

Phascolosoma luteum, Théel, *Ibid.*, p. 5, pl. ii. fig. 7, pl. iii. fig. 17.

Phascolosoma harveyi, Koren and Danielssen, Fauna littoralis Norvegiæ, Heft. iii., Bergen, p. 136, Tab. xv. figs. 41, 42, 1877.

Phascolosoma vulgare, Selenka and de Man, Die Sipunculiden, &c. (*loc. cit.*), pp. 20–23, Taf. i. fig. 1, Taf. iii. figs. 25–34, 1883.

The body is nearly 100 mm. long, the slender proboscis measures about the same. The thin skin is smooth except at the posterior extremity and at the base of the proboscis where there are numerous cylindrical papillæ, measuring up to 0·13 mm. in height, and becoming gradually smaller towards the mouth. There are about thirty-six tentacles, which are heart-shaped in cross section. The hooks are scattered, of irregular shape, mostly somewhat bent, and about 0·15 mm. long. Three fixing intestinal muscles, inserted on the gullet, on one of the first coils, and on the rectum. The proboscis has four retractor muscles. Those which are ventral spring from the anterior portion of the median third of the body, while those which are dorsal arise between the former and the anus.

Habitat.—H.M.S. "Porcupine," Station 30, August 2, 1870; lat. 36° 15′ N., long. 6° 52′ W.; depth, 386 fathoms: and Station 90, 1869; lat. 59° 41′ N., long. 7° 34′ E.; depth, 458 fathoms. This latter form might be considered as a variety of the ordinary *Phascolosoma vulgare*. Hitherto this species has been found in the Mediterranean, on the west coast of Europe (St. Vaast la Hougue, St. Malo, Roscoff, Bergen, North Sea), on the English coast, and in the Red Sea.

7. *Phascolosoma vulgare*, var. *astuta*, nov.

This variety, above referred to, differs from the typical form in having the whole body studded with papillæ, and not merely the anterior and posterior portions.

8. *Phascolosoma pudicum*, n. sp. (Pl. III. figs. 14–16).

This species bears a most marked resemblance to the *Phascolosoma vulgare* of de Blainville, both in habit and in anatomical structure, but is distinguished both from it and from the *Phascolosoma vulgare astutum* by the following characters:—the hooks are not scattered, but are arranged in distinct rows, the papillæ cover the whole body including the proboscis, the tentacles are less numerous (I counted at most twenty).

Habitat.—(*a*) Kerguelen, January 21, 1874, Cape Maclear; 30 fathoms (three specimens).

(*b*) Kerguelen, Station 149H, January 29, 1874, Cumberland Bay; 127 fathoms (numerous specimens).

(*c*) Kerguelen, 10 to 100 fathoms (one specimen).

The largest specimen measured in its extended state 36 mm., including the proboscis.

B. *Four Retractor Muscles. No Hooks on the Proboscis.*[1]

9. *Phascolosoma capense*, Teuscher.

Phascolosoma capense, Teuscher, Notiz über Sipunculus und Phascolosoma, Jenaische Zeitschr. f. Naturwiss., Jena, Bd. viii. pp. 498, 499, Taf. xix. figs. 45, 12 and 14, 1884.

Phascolosoma capense, Selenka and de Man, Die Sipunculiden, &c. (*loc. cit.*), pp. 29, 30, Taf. iii. figs. 40–43, 1883.

Of this species a great number of specimens are preserved; they vary from 20 to 35 mm. in length, not including the proboscis.

The body is four to eight times as long as it is broad. The proboscis measures about three-quarters of the length of the body. The skin is firm and somewhat shining. Even with the unaided eye one can recognise the numerous dark papillæ, which attain a height of 0·1 mm., and cover both the body and the proboscis. The ventral retractors of the proboscis spring from the middle third of the body, while those which are dorsal are at some distance from these, and spring from the anterior third. On the œsophagus there lies a long contractile tube bearing villi. The twisted intestine has about twenty double coils, and there is only a short anterior spindle-shaped muscle. There are three fixing muscles for the intestine.

Habitat.—Sea Point, near Cape Town; shallow water. November 1873.

C. *Two Retractors. No Hooks on the Proboscis.*

10. *Phascolosoma prioki*, Sluiter.

Phascolosoma prioki, Sluiter, Beiträge zur Kenntniss der Gephyreen aus dem Malayischen Archipel, Natuurkundig Tijdschrift van Nederlandsch Indie, Bd. xli. p. 152, Taf. i. figs. 5–9, Batavia, 1881.

Skin thin and smooth, without papillæ. The body is rather long and narrow, and the proboscis is longer than the body. The two retractors of the proboscis have their origin far back in the body. The spindle-shaped muscle is but slightly developed, but there are numerous muscles fixing the intestine.

[1] The presence or absence of these proboscal hooks is a distinctive character for most of the species of the genera—*Phascolosoma*, *Phymosoma*, and *Phascolion*. But since the hooks sometimes fall off entirely, too much stress must not be laid upon this specific difference. In no case, however, is the presence or absence of hooks on the proboscis a distinction between genera.

On anatomical examination the minute specimen (13 mm.) of the Challenger Expedition was seen to be identical with the *Phascolosoma prioki* of Sluiter.

Habitat.—Station 214, on February 10, 1875; lat. 4° 33′ N., long. 127° 6′ E.; depth, 500 fathoms; bottom temperature, 41°·8; blue mud; dredged.

Sluiter obtained his specimens from *Dentalium* shells at Tandjong Priok, Batavia. In regard to the specimen above referred to, there is no note as to whether it also was obtained from a Mollusc shell.

11. *Phascolosoma catharinæ*, Fritz Müller.

Phascolosoma catharinæ, Fritz Müller; Grube, Notiz über Loxosiphon, Cloeosiphon und einige Phascolosomen, Jahresbericht der Schles. Gesellsch. für vaterl. Cultur, Jahr 1867, p. 48, Breslau, 1868.

Phascolosoma catharinæ, Selenka and de Man, Die Sipunculiden, &c. (*loc. cit.*), pp. 15, 16, Taf. ii. fig. 16, Taf. v. figs. 60–63, 1883.

The body is long and narrow, with a slender proboscis four times as long as the body. The skin is thin and iridescent. Only with the aid of a lens can one recognise the minute papillæ which cover the whole body. These papillæ are thinly scattered and have a conical form. At the posterior end of the body they measure 0·066 mm. in height and half as much in breadth, at the middle of the body they are somewhat smaller, and at the base of the proboscis somewhat larger again (up to 0·09 mm. in height). There are two slender ventral retractors, which originate in the posterior fourth part of the body, and which do not unite till far forward in the proboscis. The contractile tube is studded with short villi. The coils of the intestine are not numerous. There are two fixing muscles on the anterior coils. The two free segmental organs open a short distance in front of the anus.

Habitat.—Station 323, February 28, 1876; lat. 35° 39′ S., long. 50° 47′ W.; depth, 1900 fathoms; bottom temperature, 33°·1; blue mud; trawled. Of this there is only a single specimen.

Since Fritz Müller's specimen was labelled "Desterro," one may infer that it was not obtained in trawling, but was found on the shore during ebb tide. The specimen of the Challenger Expedition, on the other hand, was obtained from a very considerable depth. This difference of distribution is not, however, by any means unique, for other true Sipunculids exhibit a similar occurrence on the shore and at considerable depths.

12. *Phascolosoma flagriferum*, n. sp. (Pl. III. fig. 17).

Body and proboscis studded with very small papillæ, hardly visible with a lens. The posterior end of the body is furnished with wart-like papillæ measuring half a millimetre, and with a whip-like appendage. The coils of the intestine are very numerous.

The largest of the three specimens of this form measured with outstretched proboscis was 130 mm. in length, and had a breadth of about 13 mm.

The two retractors of the proboscis spring from about the middle of the body; after a short course they run together. The looped intestine has seventy coils or more, and is free posteriorly. In front, attached to the œsophagus, there is a long fixing muscle. There is also a spindle-shaped muscle. There are two segmental organs, entirely free, and opening beside the anus. Hooks are absent. Round about the mouth there is a circle of finger-like tentacles, heart-shaped in cross section. There is a simple contractile tube. The body-wall is rather thin but elastic.

In the Challenger collection there are two well-preserved specimens from the Pacific, and another single specimen from the east coast of North America. In spite of this very wide difference in distribution, a close comparison revealed no structural difference worth recording.

Habitat.—(*a*) Station 241, June 23, 1875; lat. 35° 41′ N., long. 157° 42′ E.; depth, 2300 fathoms; bottom temperature, 35°·1; red clay; trawled (two specimens).

(*b*) Station 44, May 2, 1873; lat. 37° 25′ N., long. 71° 40′ W.; depth, 1700 fathoms; bottom temperature, 36°·2; blue mud; dredged (one specimen).

Genus 6. *Dendrostoma*, Grube.

Longitudinal musculature continuous and not divided into separate bands. The tentacles are united into four to six bundles. There are two free segmental organs. intestine spirally coiled, the intestinal spiral free posteriorly. Hooks present except when they have fallen off. Short, compressed, tropical, shore forms.

13. *Dendrostoma blandum*, Selenka and de Man.

Dendrostoma blandum, Selenka and de Man, Die Sipunculiden, &c. (*loc. cit.*), pp. 85, 86, Taf. i. fig. 9, Taf. xi. figs. 159–162, 1873.

Body swollen. Proboscis rather short. Skin brownish, of moderate thickness. On the middle of the proboscis is a zone of numerous, scattered, pointed, black hooks, 0·4 mm. in height, and therefore distinctly noticeable even to the naked eye. The whole body is studded with small scattered papillæ with a circular base. The tentacles are arranged in five (to six) main bundles. There are two powerful ventral retractors of the proboscis which have their origin in the median third of the body. Two segmental organs completely free. The contractile tube is destitute of villi.

Habitat—Yokohama (Japan); depth, 5 to 25 fathoms. May 6, 1875.

The only specimen obtained was found in the same place as those which have been previously recorded, namely, on the coast of Japan. Dr. Hilgendorf found the animal at a depth of 4 fathoms.

Genus 7. *Phascolion*, Théel (Selenka and de Man).

The animals of this genus live in tubes or in shells of Molluscs. The longitudinal musculature is continuous and not divided up into distinct bands. The tentacles are small and finger-like, and are arranged in a circle round about the mouth. There is only a single, fixed segmental organ. The intestine has only a few coils, or it may be none at all, but there are always some large loops which are attached by the so-called fixing muscles. The hooks of the proboscis often fall off at an early stage. The proboscis has either one or two retractor muscles. The posterior half of the body frequently with attaching papillæ (Haftpapillen). They are found in all seas, but especially in the colder waters.

It seems extremely probable that the species of the genus *Phascolion* do not form a compact, closely related group, but that they have developed independently from various true *Phascolosomata*. One marked characteristic of the species of *Phascolion* is the disappearance of one of the two segmental organs. Noteworthy also is the shortening of the intestine, associated with the assumption of the looped instead of the spirally coiled form. Now since all the species of *Phascolion* live in Mollusc tubes, the change of habitat must have reacted on the anatomical structure; it may, for instance, have to do with the degeneration of one of the segmental organs, and it may be that the burden of the shell has brought about the early attachment of the intestine by means of the fixing muscles. The fact that in many species of *Phascolosoma*, which inhabit Mollusc shells or tubes, one of the segmental organs is often absent but the coiled intestine apparently not shortened, shows us how such a degeneration as that of the species of *Phascolion* has arisen. In the latter, as we have mentioned, the spirally coiled intestine is unwound into loose loops, and there are transitional states between the two conditions.

If the supposition be correct that the species of the genus *Phascolion* are connected with those of the genus *Phascolosoma* by diverse lines of origin, the genus *Phascolion* should be resolvable into several, since the system ought to be the expression of phylogenetic relationship or genetic history. But since it is not possible to recognise these genetic relationships, far less prove them, I therefore retain for the present the single genus *Phascolion*.

14. *Phascolion squamatum*, Koren and Danielssen (Pl. IV. figs. 18–19).

Phascolosoma squamatum, Koren and Danielssen, Fauna littoralis norvegiæ, Heft iii. pp. 130, 131, Tab. xiii. fig. 11, Tab. xiv. figs. 14, 15.

Phascolosoma squamatum, Selenka and de Man, Die Sipunculiden, &c. (*loc. cit.*), p. 40.

The body is four times as long as it is broad. The proboscis is two and a half times as long as the body. The skin is studded all over with large, flat, more or less protrusive scales. On the proboscis are fine papillæ, arranged in separate rows and at a distance from one another, but somewhat more closely set near the tentacles. The tentacles are

short and thread-like. There is only one retractor muscle, which has four very short roots inserted at the hind end of the body. The intestine exhibits five loose loops in the right half of the body, and then passes into the close spiral with sometimes twelve double coils. A thin contractile tube. Only one segmental organ, on the left side of the body. The body is not more than 11 mm. in length.

Habitat.—(*a*) H.M.S. "Porcupine," Station 6, 1870; lat. 48° 26′ N., long. 9° 44′ W.; 358 fathoms.

(*b*) H.M.S. "Porcupine," Station 47, 1869; lat. 59° 34′ N., long. 7° 18′ W.; 542 fathoms.

(*c*) H.M.S. "Porcupine," Station 36, 1869; lat. 48° 50′ N., long. 11° 9′ W.; 725 fathoms.

(*d*) H.M.S. "Triton," Station 10, August 24, 1882; lat. 59° 40′ N., long. 7° 21′ W.; 516 fathoms.

The intestine contained numerous *Globigerina* shells, besides sand and fine débris of mussel-shells and of the calcareous plates of Echinodermata.

This species occupies a position only just within the genus *Phascolion*, being indeed a sort of connecting link with the genus *Phascolosoma*. It may be ranked as a species of *Phascolion* on account of (1) the disappearance of one of the two segmental organs and the fixing of the remaining one by means of a mesentery, (2) the coalescence of the retractors of the proboscis and the shifting of their insertion to the hind end of the body, (3) the smaller size of the tentacles, (4) the larger size of the eggs, (5) the development of the ordinary dermal papillæ into attaching papillæ, (6) the partial unwinding of the intestinal spiral into loose coils. On the other hand, since the intestinal spiral may still have as many as twelve double coils, the species may be claimed, as Koren and Danielssen have done, for the genus *Phascolosoma*. On the whole, however, there seems more reason, as we have indicated, to refer the species to the genus *Phascolion*.

15. *Phascolion lutense*,[1] n. sp. (Pl. IV. figs. 22, 23).

The skin is thin and without attaching papillæ (Haftpapillen) on the posterior part of the body. The whole body and proboscis studded with numerous scattered skin glands. These protrude as slight tubercles, and are supported by chitinous borders, which appear circular or elliptical according to the state of contraction of the cutaneous muscles. The diameter of these glands measures about one-third of a millimetre, but in the region about the base of the proboscis and about the anus the diameter is reduced by one-half or even much more. On the proboscis and on the posterior extremity of the body the glands bear villous-like bodies round their opening (Hohlpapillen). These papillæ are about

[1] *Lutensis*, living in the mud.

0·08 mm. long by 0·025 mm. broad; on other parts of the body they are wholly absent. There is only one retractor to the proboscis. The intestinal spiral has about twenty-three coils. The animal makes tubes in the mud.

Two of the three specimens were examined. The length of the largest was 30 mm., with proboscis wholly retracted. The thin transparent skin of the body was not coloured, the zone round about the anus was light brown.

Hooks on the proboscis absent. The tentacles are short and small. As in the other species of *Phascolion*, the tentacles are few in number, at most sixteen. The single retractor of the proboscis originates just in front of the hind end of the body, and possesses several diverging roots. Far back in the body, where the œsophagus passes into the intestine, the latter is attached by one fixing muscle. There are, however, some other fixing muscles on the threefold loops of the intestine and on the rectum.

The single segmental organ is on the right side of the body. It lies close behind the anus, and is throughout its whole length bound by connective tissue bands to the inner body-wall.

This species is distinctly characterised by the large number of intestinal coils and by the nature of the skin glands.

Habitat.—The animals were found in two localities near one another.

(*a*) Station 157, March 3, 1874; lat. 53° 55′ S., long. 108° 35′ E.; depth, 1950 fathoms; Diatom ooze; bottom temperature, 32·1; trawled. (Two specimens with thick mud tubes.)

(*b*) Station 156, February 26, 1874; lat. 62° 26′ S., long. 95° 44′ E.; depth, 1975 fathoms; Diatom ooze; trawled. (One specimen and several mud tubes.)

16. *Phascolion tubicola*, Verrill.

Phascolion tubicola, Verrill, Results of Recent Dredging Expeditions on the Coast of New England, Amer. Journ. Sci. and Arts, ser. 3, vol. v., 1873, p. 99 (note); see also Explorations of Casco Bay by the U.S. Fish Commission in 1873, Proc. Amer. Assoc. Adv. Sci., 22nd meeting, 1874, pp. 388, 389.

Phascolion tubicola, Selenka and de Man, Die Sipunculiden, &c., pp. 21, 25, Taf. vi. figs. 80–86.

Body extended. Proboscis longer than the body. The whole body is covered with papillæ, which are small on the anterior portion of the proboscis and on the posterior half of the body, but are larger in other regions. On the posterior third of the body, with the exception of a short strip at the very end, there is a zone of irregularly scattered, triangular, yellowish-red prickles, with their points directed forwards. The proboscis bears a few brownish, pointed, unbent hooks which measure 0·06 mm. in length. There is a circle of from ten to twenty tentacles round about the mouth. Two retractor muscles, a thin ventral one and a thicker stronger dorsal one, are inserted with broad roots near the hind end of the body, and are not united till they have run well forwards.

The intestine is in loops, and the intestinal spiral exhibits only two coils. The single short segmental organ opens far behind the anus.

According to Verrill's report, this abundant species is only found in deep water.

Habitat.—Station 49, May 20, 1873; lat. 43° 3′ N., long. 63° 39′ W.; depth, 85 fathoms; bottom temperature, 35°; gravel, stones; dredged.

17. *Phascolion botulus*, n. sp. (Pl. IV. fig. 20).

On the posterior third of the body there are scattered rounded-off attaching papillæ (Haftpapillen), measuring 0·3 mm. in their greatest breadth and about 0·12 to 0·18 mm. in height. Two retractor muscles, one very powerful and another weak. Found in *Dentalium* shells.

It is impossible for me to give any complete description of this species, since only one imperfectly preserved specimen, 30 mm. long, was available for examination. This animal lay within the shell of a *Dentalium*, wholly embedded in mud. The intestine was somewhat destroyed by maceration.

One of the above mentioned papillæ, found on the posterior third of the body, is represented in fig. 20. They are distinctly visible to the unaided eye, especially since their brown pigment stands in marked contrast to the thin colourless skin of the body.

No hooks were to be found. The proboscis was almost completely retracted, in the living animal it was probably longer than the body, measured from the hind end to the anus.

The tentacles are small and few in number. No exact enumeration was possible.

The root of the more powerful retractor of the proboscis was divided into five; both retractors originated just in front of the hind end of the body.

The intestine exhibits a threefold, ascending and descending, loop, and the spiral consists of only two or three coils. The single segmental organ is half the length of the body, and at its very end is bound by mesentery to the body-wall.

Habitat.—Station 195, October 3, 1874; lat. 4° 21′ S., long. 129° 7′ E.; depth, 1425 fathoms; bottom temperature, 38°; blue mud; trawled.

18. *Phascolion strombi*, (Montagu) (Pl. IV. fig. 21).

Sipunculus strombus, Montagu, Trans. Linn. Soc. Lond., vol. vii. pp. 74–76, 1804.
Sipunculus bernhardus, Forbes, A History of British Starfishes, London, 1841, pp. 251–253 (woodcut).
Sipunculus concharum, Danielssen, Nyt Magaz. f. Naturvidensk. Christiania, 1861, pp. 57, 58.
Phascolosoma strombi, Keferstein, Beiträge zur Anatomie und System. Kenntniss der Sipunculiden, Zeitschr. f. wiss. Zool., 1868, Bd. xv. pp. 430–432, Taf. xxxi. fig. 10, Taf. xxxiii. figs. 34–36.
Phascolosoma strombi, Selenka and de Man, Die Sipunculiden, &c. (*loc. cit.*), pp. 50–53.

From among the many descriptions of this species, those above given will be sufficient (see the Bibliography in Die Sipunculiden, Selenka, de Man, and Bülow, pp. 50, 53).

The body is from four to seven times as long as it is broad. The proboscis is as long as the body or still longer. The skin is thin and covered with small scattered papillæ. Behind the middle of the body there is a broad girdle of flat attaching papillæ, measuring 0·24 mm., and arranged sparingly after a quincuncial pattern. In front on the proboscis there are several rows of simple hooks, whose bases measure about 0·05 mm. The ventral retractor of the proboscis is united with the dorsal to form one muscle. The intestinal spiral is short, with only two to four coils. There is on the rectum a small diverticulum. The contractile tube is without cæca. The single segmental organ is fastened to the body-wall by numerous bands.

Habitat.—H.M.S. "Porcupine," Killibegs Harbour, Ireland, June 24, 1869.

Genus 8. *Aspidosiphon*, Grube.

At the anus and at the posterior end of the body there is a distinct shield. The proboscis is very long, and much thinner than the body. It is excentric, and originates ventrally from the anal shield. There are almost always hooks present, and these usually exhibit two forms. The longitudinal musculature may be either continuous or separated into bands. The tentacles, which are small and finger-shaped, are few in number. Found in all seas.

19. *Aspidosiphon speculator*, n. sp. (Pl. IV. figs. 24–27).

The anal shield is rough and granulated: the posterior shield is grooved in a radiate fashion (with about thirty peripheral grooves). The longitudinal musculature of the body-wall is divided up into bands.

In the three specimens preserved, the colour of the general body surface was yellowish-brown, that of the anal and caudal shield dark brown. The body of the largest animal measured 14 mm. in length. The proboscis was of equal length, but one may certainly suppose that it could be very much elongated, as is the case in all the other species of *Aspidosiphon*.

In the anterior third of the body there are about twenty-two bundles of longitudinal muscles, anastomosing in a complex manner. Through the other two-thirds of the body these run in the form of fine distinct bands. The two strong ventral retractors of the proboscis originate a short way in front of the caudal shield and run together about half way up the body.

In *Aspidosiphon speculator*, as in all species of *Aspidosiphon*, the tentacles are few and short.

The skin glands are supported by countless small plates of chitin, which form a ring

round the opening of each gland. These structures do not, however, form papillæ, but at most appear as flat tubercles when the body-wall is very powerfully contracted.

The whole proboscis is thickly studded with hooks of two forms. On the anterior half the hooks are flattened, with a strongly curved double point; they measure 0·032 mm. in height, and are arranged in distinct rings. On the posterior half of the proboscis the hooks are scattered and in the form of three-sided pyramids, with but slightly bent points. Over the whole proboscis are seen the openings of the ducts (0·017 mm. in length) of the cutaneous glands. On the anterior half of the proboscis these occur in rows between the rings of hooks, about one duct for every three to five hooks; on the posterior half of the proboscis they occur much more sparingly, and are scattered.

The anal and caudal shields are formed from numerous small polygonal or rounded chitinous plates, which are somewhat larger and thicker round the margins of the shields.

The intestine forms a spiral, and a small diverticulum is present. There are two very large segmental organs, which are for half their length attached by means of mesenteries.

St. Vincent (Cape Verde Islands); shallow water.

20. *Aspidosiphon truncatus*, Keferstein.

Aspidosiphon truncatus, Keferstein, Untersuchung über einige amerikanische Sipunculiden, Zeitschr. f. wiss. Zool., 1866, xvii. p. 50, Taf. vi. figs. 15–18.

Aspidosiphon truncatus, Selenka and Bülow, Die Sipunculiden, &c. (*loc. cit.*), pp. 118, 119, Taf. xiii. figs. 193–195.

The body is brown, the two grooved shields are of a darker colour. The grooves of the anal shield run from the ventral side to the margin, those of the caudal shield run in radiate fashion. There are numerous rings of very small bent hooks. The longitudinal musculature is divided into strands. The retractor of the proboscis has two roots which originate on the posterior shield. At the point where the intestinal spiral passes into the rectum there is a diverticulum in connection with the latter. Both segmental organs are for the most part attached by mesentery to the body-wall.

Of this species a large number of specimens from the Philippines have been preserved, and I find after examination that they do not in any way differ from those forms which Agassiz found off Panama, and Möbius off Mauritius. The range of distribution must therefore be very wide. It might indeed be possible on close comparison to establish between our forms and those investigated by Keferstein a difference great enough to be considered a specific distinction, but with the form from Mauritius the Philippine species is certainly identical.

The animals were on an average 17 mm. long, not including the proboscis.

Habitat.—Station 201, October 26, 1874; lat. 7° 3′ N., long. 121° 48′ E.; depth, 82 fathoms; stones and gravel; trawled.

Genus 9. *Phymosoma*, Quatrefages (Selenka and de Man).

Longitudinal musculature divided into bands. There are numerous tentacles arranged in a single row, not however around the mouth, but above it dorsally in three-fourths of a circle. The body is covered with papillæ. Hooks are almost always present. The intestine is coiled in a spiral fashion. The eggs are elliptical and flattened. The proboscis has four retractor muscles. There are two eye spots. The members of this genus are mostly of considerable size, and the majority are tropical forms.

21. *Phymosoma japonicum*, Grube.

Phymosoma japonicum, Grube, 51th Jahresbericht der Schlesischen Gesellschaft für vaterländische Cultur, Breslau, 1877, p. 73.

Phymosoma japonicum, Selenka and de Man, Die Sipunculiden, &c. (*loc. cit.*), pp. 76–78, Taf. ii. figs. 18, 19, Taf. x. figs. 145, 146.

The body is compressed. The proboscis is as long as the body. Even with the naked eye one can clearly recognise the reddish-brown papillæ on the greyish-brown body. They are largest and most abundant at the base of the proboscis and at the hinder end of the body. On the older specimens there may be thirty rings of hooks, and on the young forms as many as a hundred. These hooks are flattened, measuring 0·07 mm. in height and the same in breadth; they have a sharply bent point with a side tooth. There are not more than twenty-eight tentacles. There may be as many as thirty longitudinal muscle-bands, which repeatedly anastomose. The intestine exhibits ten to twelve double coils. The two segmental organs are fixed by mesenteries throughout half their length.

Habitat.—Port Jackson, shallow water. There were only two tolerably large specimens.

22. *Phymosoma scolops*, Selenka and de Man.

Phymosoma scolops, Selenka and de Man, Die Sipunculiden, &c. (*loc. cit.*), pp. 41, 42, Taf. ii. fig. 17, Taf. x. figs. 138–141.

A small species with slender body, and proboscis equal to the body in length. The skin is thin. The proboscis frequently exhibits brown cross stripes on the dorsal surface. The whole body is studded with small papillæ. The proboscis has about sixteen rings of hooks, which are bent and measure 0·07 mm. in height, and 0·074 mm. at the base. On the concave side of the bent point there is a lateral tooth. The tentacles number twelve or more. There are about twenty longitudinal muscles which rarely anastomose, but unite just in front of the anus to form a continuous sheath. The four retractors of the proboscis originate about the middle of the body. The broader ventral retractors

consist of five or six longitudinal muscles, the narrower dorsal of one or two, originating a short distance in front of the former. The contractile tube is simple. On the intestinal spiral there are only from twelve to fourteen double coils. The posterior fourth part of both segmental organs is free.

Habitat.—This species has a somewhat wide range of distribution. Specimens have been obtained from the Philippines, from Singapore, and from the Red Sea; and Peters found a variety off Mozambique.

The single small specimen of the Challenger Expedition was labelled Station 208, January 7, 1875; lat. 11° 37′ N., long. 123° 31′ E.; depth, 18 fathoms; blue mud; trawled.

In the manuscript left by the late von Willemoes-Suhm I find some sketches and notes of a Sipunculid, which he considered as representative of a new genus. It is, however, a true *Phymosoma*, and seems indeed to be closely related to *Phymosoma varians*. But since the single specimen is only imperfectly preserved, so that a satisfactory diagnosis is now impossible, and since, further, the form exhibits no characters of special interest, I content myself with this reference.

Genus 10. *Sipunculus*, Linné.

The longitudinal musculature is divided into seventeen to forty-one bands. The proboscis has four retractors. The body is destitute of papillæ. The tentacles always surround the mouth, and either form a lobed membrane or are finger-shaped. There are no hooks, except in *Sipunculus australis*. Most of the species are large. They are found in all seas.

23. *Sipunculus nudus*, Linné.

This species, named by Linné,[1] is thoroughly described in Die Sipunculiden (*loc. cit.*), pp. 92–95.

Habitat.—It has been found in the Mediterranean, on the west coast of France, in the North Sea, off the West Indies, Florida, and the Philippines. The two specimens preserved came from the Spanish coast and from the North Sea, and are labelled as follows:—

(*a*) H.M.S. "Porcupine," No. 30, August 2, 1870; lat. 36° 15′ N., long. 6° 52′ W.; depth, 386 fathoms.

(*b*) H.M.S. "Porcupine," No. 22, 1869; lat. 56° 8′ N., long. 13° 34′ W.; depth, 1263 fathoms.

[1] Systema Naturæ, Editio duodecima I. Holmiæ, 1766, p. 1078.

C. Appendix.

Among the worms entrusted to me for investigation there was a *Chætoderma* from the Malayan Archipelago. In spite of the investigations of Lovén, Keferstein, Möbius, Graff, and Arnauer Hansen, the systematic position of this animal remains a very debateable question. Nor am I able to contribute anything to the elucidation of the problem, for the single specimen at my disposal was too soft and too easily broken to admit of the investigation of its internal structure. Nor did the examination of a series of cross-sections yield me the desired information. This only I am able to affirm, that the specimen of the Challenger Expedition does not structurally differ in any essential point from the *Chætoderma nitidulum*, Lovén, from the North Sea. There were, however, noticeable differences in the form of the calcareous spicules, and on these I have been compelled to base the diagnosis of the species.

Genus 11. *Chætoderma*, Lovén.

Worm-like hermaphrodite animals without segmentation. A cerebral ganglion and paired lateral nerve-cords. The mouth bears teeth, and the whole body is studded with calcareous spicules.

24. *Chætoderma militare*, n. sp. (Pl. IV. figs. 28–32).

The calcareous spicules of the proboscis are in the neighbourhood of the mouth flat and elliptical, further back they are larger and have the form of shovel-like or tongue-like plates, and finally, they gradually become smaller again and take the form of keeled spear-like points. The body proper bears only a very few thinly scattered rounded calcareous plates, but at the posterior end there are again large plates, which towards the anus become long stout prickles with a cross-section between circular and elliptical. Round about the anus are numerous small prickle-like or awl-shaped calcareous needles.

Habitat.—Station 210, January 25, 1875; lat. 9° 26′ N., long. 123° 45′ E.; depth, 375 fathoms; bottom temperature 54°·1, surface temperature 80°·2; blue mud.

I regret that it is impossible for me to give a more accurate diagnosis of this species. The only species of *Chætoderma* as yet known, namely the *Chætoderma nitidulum*, Lovén, was found in the North Sea, and it would have been desirable to submit to a close comparison forms found in such different localities.

But since the nature of the calcareous spicules affords a ready distinctive character, I do not hesitate to establish the single example of the Challenger Expedition as a new

species. In *Chætoderma nitidulum*, Lovén, the calcareous needles, for instance, on the hind end of the body are, according to Greeff's report (Anatomie des Chætoderma nitidulum, Lovén, Zeitschr. f. wiss. Zool., Bd. xxvi. Taf. xiii. figs. 24–26), also flattened, but they are not elliptical in cross-section, like those of *Chætoderma militare*. And again, the spicules on the body of the latter are much less numerous, and we cannot doubt that the examination of fresh or well-preserved specimens of the tropical form would reveal other differences, which, with the material before me, I am unable to detect.

GEOGRAPHICAL DISTRIBUTION.

The following table exhibits the geographical distribution and the occurrence of the species described. I have also noted the localities where those species already known have been previously found.

Species observed in the Challenger and "Porcupine" Expeditions.						Species previously observed.	
Name.	Station.	"Porcupine" Voyage.	Locality.	Depth in Fathoms.	Character of the Bottom.	Depth.	Locality.
Sternaspis princeps, n. sp.	167	...	lat. 37° 34′ S. long. 179° 22′ E.	700	Blue mud.	...	.
Echiurus unicinctus, v. Drasche.	...	...	Japan.	...	...	...	Japan.
Thalassema fusca, n. sp.	...	P.	lat. 60° 34′ N. long. 4° 40′ E.	569	...	..	.
Thalassema baronii, Greeff.	...	...	Bahia.	7–20	...	...	
Bonellia salmii, n. sp.	47	...	Nova Scotia, lat. 41° 15′ N. long. 65° 45′ W.	1340	Blue mud.	...	.
Phascolosoma vulgare, Blainville.	30	P.	lat. 36° 15′ N. long. 6° 32′ W.	386	...	Near low water mark.	West coast of Europe, Mediterranean, Red Sea.
Phascolosoma vulgare, var. *ustulatum*, nov.	90	P.	lat. 59° 41′ N. long. 7° 34′ W.	458	...	...	...
Phascolosoma pudicum, n. sp.	...	...	Kerguelen.	10–120	...	..	..
Phascolosoma capense, Teuscher.	...	...	Sea Point, near Cape Town.	Shallow water.	...	..	Cape.
Phascolosoma prioki, Sluiter.	214	...	lat. 4° 33′ N. long. 127° 6′ E.	500	Blue mud.	.	Batavia.
Phascolosoma catharinæ, Fritz Muller.	323	...	lat. 35° 39′ S. long. 50° 47′ W.	1900	...	..	Desterro.
Phascolosoma flagriferum, n. sp.	241	...	lat. 35° 41′ N. long. 137° 42′ E.	2300	...	...	...
	45	...	lat. 37° 25′ N. long. 71° 43′ W.	1700	...	..	.
Dendrostoma labiatum, Selenka and de Man.	...	...	Yokohama.	5–25	...	...	Japan.
Phascolion luteum, n. sp.	...	...	lat. 62° 26′ S. long. 95° 44′ E.	1975	Diatom ooze.	..	
			lat. 53° 55′ S. long. 108° 37′ E.	1950	Diatom ooze.	...	.
Phascolion tubicola, Verrill.	49	...	lat. 4° 21′ S. long. 129° 7′ E.	85	Gravel, stones.	Frequently in deep water.	New England.
Phascolion botulus, n. sp.	195	...	lat. 4° 21′ S. long. 129° 7′ E.	1425	Blue mud.	...	...
Phascolion strombi (Montagu).	...	P.	Killibegs Harbour, Ireland.	...	...	...	North Atlantic.
Phascolion squamatum, Koren and Danielssen.	6 10 36 47	P.	...	358–725	...	100–200	North Sea, Lofoten, &c.
Aspidosiphon speculator, n. sp.	...	...	St. Vincent (Cape Verdes).	Shallow water.	...	.	..
Aspidosiphon truncatus, Keferstein.	201	...	lat. 7° 3′ N. long. 121° 48′ E.	82	Stones, gravel.	.	Panama, Mauritius.
Phymosoma japonicum, Grube.	...	...	Port Jackson.	Shallow water.	...	...	Japan.
Phymosoma scolops, Selenka and de Man.	208	...	lat. 11° 37′ N. long. 123° 32′ E.	18	Blue mud.	.	Philippines, Singapore, Mozambique, Red Sea.
Sipunculus nudus, Linné.	30	P.	lat. 36° 18′ N. long. 6° 52′ W.	386	...	..	Mediterranean, West coast of Europe, West Indies, Philippines.
	22	...	lat. 56° 8′ N. long. 13° 34′ W.	1263	...		
Chatoderma militare, n. sp.	210	...	lat. 9° 26′ N. long. 123° 45′ E.	375	Blue mud.	...	.

PLATE I.

Fig. 1. *Sternaspis princeps*, n. sp.

Three times the natural size; viewed from the ventral aspect.

Fig. 2. *Echiurus unicinctus*, von Drasche; $\frac{2}{1}$.

A. Anal vesicles (with ciliated funnels).
a Anal opening.
B. Setæ.
b. The posterior circle of setæ.
β. Fixing muscles of the intestine.
D. Intestinal canal.
α. Diverticulum of the intestine.
γ. Blood-vessel accompanying intestine.
K Cloaca.
L. Body-wall.
n. Ventral nerve-cord.
R. Proboscis.
Rm. Circular muscles of the body-wall.
S. Pharynx.
Σ. Segmental organs.
sp. Spiral tubes of the segmental organs.

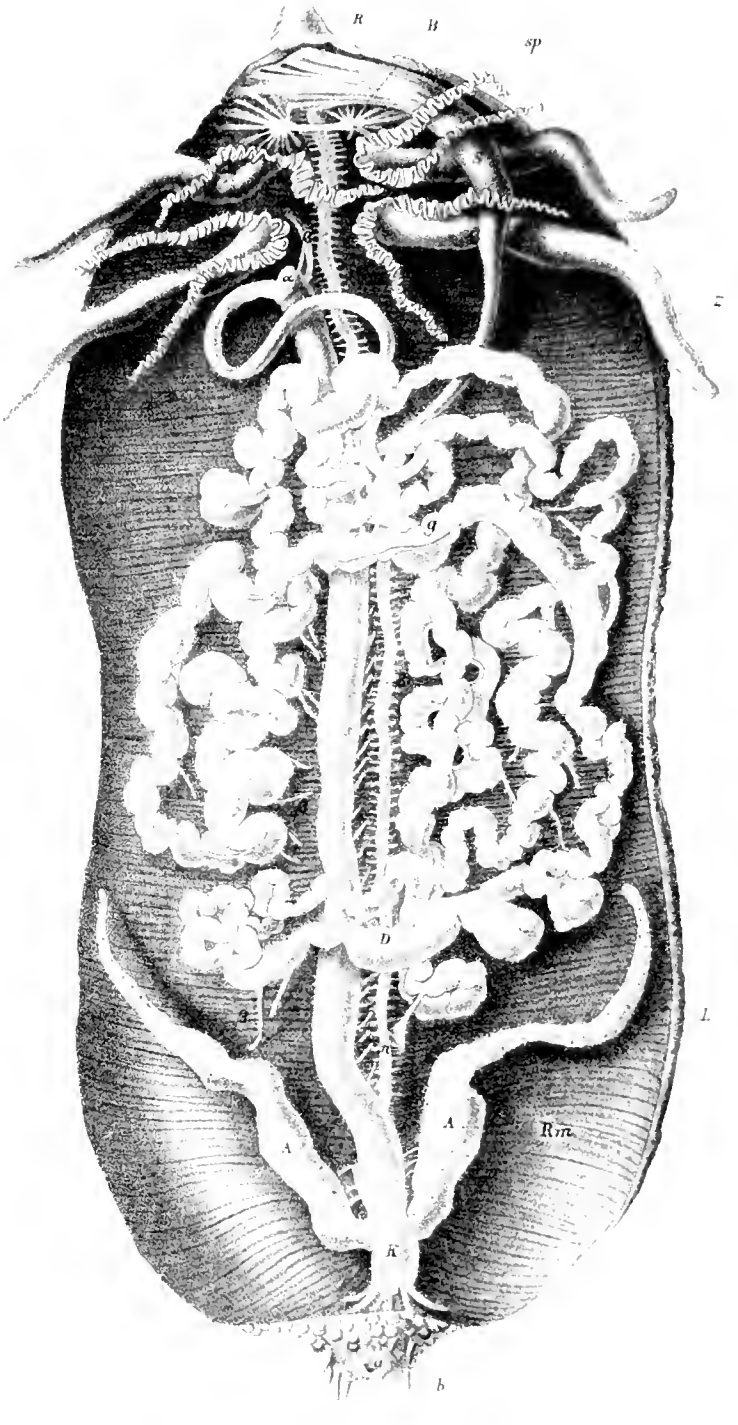
Fig. 3. *Bonellia suhmii*, n. sp.; natural size.

The figure is copied from the original drawing of Dr. v. Willemoes-Suhm. Both the hind end of the body and the proboscis were torn away.

a. Mouth opening.
r. Opening of uterus.

1

2



3

Selenka de

1. STERNASPIS PRINCEPS n. sp.
2. ECHIURUS UNICINCTUS v. Drasche. 3. BONELLIA SUHMII n. sp.

PLATE II.

PLATE II.

Figs. 4–6. *Bonellia suhmii*, n. sp.

Fig. 4. The internal structure of the very imperfect specimen represented in fig. 3; natural size.

i, *i*. Intestine.
n, *n*. Nerve-cord.
o. Mouth.
ΣΣ. The two anal vesicles.
U. Uterus.
Y. Torn loop of the intestine.

Fig. 5. The uterus, with low power.

T. Ciliated funnel.
m. Efferent aperture.

Fig. 6. The anterior half of an anal vesicle, with medium power.

Figs. 7–10. Male of *Bonellia viridis*, Rol., from Trieste.

Fig. 7. Adult male $1\frac{1}{2}$ mm. long, with high power. The two hooks had fallen off. The nervous system could not be demonstrated.

b. Anterior blind end of the intestine, attached to the parenchymatous tissue by means of contractile muscle-fibres.
b'. Posterior blind end of the intestine, kept *in situ* by means of isolated muscular fibres.
c. Green wandering cells, containing chlorophyll.
d. Connective substance.
e. Ciliated epithelium.
f. Vesicular cells.
g. Generative opening, and near it some expelled spermatozoa.
i. Intestine.
l. Body-cavity.
m. Musculature.
o. Contractile fibres.
p. Nuclei of the peritoneal epithelium.
r. Spermatozoa.
s. The right anal vesicle (Analkieme)—segmental organ.
s'. The left anal vesicle (Analkieme)—segmental organ.
vd. Vas deferens.
y, *y*. External apertures of the segmental organs.
z. Contents of the intestine.

Fig. 8. Cross section in the region A of fig. 7, drawn with the aid of the camera lucida from a chrom-osmic acid preparation.

n. The inferior swelling of the œsophageal ring (the first pair of ventral ganglia).
The other letters are as in fig. 7.

Fig. 9. Cross section in the region B of fig. 7. Letters as above.

Fig. 10. One of the so-called anal vesicles (segmental organs), with very low power. The right is always somewhat smaller, and lies somewhat further back than the left. Each of these segmental organs opens separately to the exterior, ventrally and laterally. By the contractions of the body-wall the blood of the body-cavity and with it the free funnels of the segmental organs are driven backwards and forwards. The rim of the funnel is formed of from five to seven ciliated cells. The lumen of the segmental duct is ciliated, but only interruptedly, not continuously.

c. Wall.
u. Lumen with lash-like cilia.
x. Funnel opening.
z. Exterior opening.

Selenka del

4-6. BONELLIA SUHMII, n sp.
7-10. BONELLIA VIRIDIS, Rol. mas.

PLATE III.

PLATE III.

Figs. 11, 12. *Echiurus unicinctus*, von Drasche.

Fig. 11. The large terminal funnels from the anal vesicles; × 900. The pointed flagellate cells of the funnel margin are figured from a fresh specimen of *Echiurus pallasii*.

a. The flagellate cells forming the rim of the funnel.
p. Nuclei of the peritoneum.
i. The internal wall of the funnel.
k. Communication between the canal of the funnel and the lumen of the anal vesicle.
m. Branched contractile cells occupying the interspace between the inner and outer walls of the funnel.

Fig. 12. A smaller lateral funnel. Letters as in fig. 11.

Fig. 13. *Thalassema faex*, n. sp.

Fig. 13. One of the two anal vesicles; magnified 8 times.

r. Opening into the cloaca.

Figs. 14–16. *Phascolosoma pudicum*, n. sp.

Fig. 14. Hooks of the proboscis arranged in a ring; × 140.

Figs. 15, 16. Papillæ from the surface of the body; × 350.

Fig. 17. *Phascolosoma flagriferum*, n. sp.

Fig. 17. The animal drawn natural size.

a. Anus.

Selenka del.

11-12. ECHIURUS UNICINCTUS. Drasche lith. 13. THALASSEMA FAEX. n.
14-16. PHASCOLOSOMA FUDICUM. n. 17. PHASCOLOSOMA FLAGRIFERUM. n.

PLATE IV.

PLATE IV.

Figs. 18, 19. *Phascolion squamatum*, Koren and Danielssen.

Fig. 18. The animal magnified 5 times.

Fig. 19. Scales from the surface of the body, seen with low power.

a. A papilla from the proboscis, under high power.

Fig. 20. *Phascolion botulus*, n. sp.

Fig. 20. Hooked papilla; magnified 160 times.

Fig. 21. *Phascolion strombi* (Montagu).

Fig. 21. Specimen from Killibegs Harbour, Ireland; magnified 4 times.

Figs. 22, 23. *Phascolion intense*, n. sp.

Fig. 22. The animal magnified thrice. On the proboscis the cutaneous glands are visible.

Fig. 23. Two adjacent glands with papillæ round their openings, from the hind end of the body; magnified 200 times.

Figs. 24–27. *Aspidosiphon speculator*, n. sp.

Fig. 24. The internal structure; magnified 5 times.

A. The rough anal shield.
a. Anus.
D. Intestinal spiral.
H. End of proboscis (not stretched out to its full length).
n. Ventral nerve-cord.
R. Proboscis.
Rm. Retractor of the proboscis.
ΣΣ′. Segmental organs.
S. The caudal shield with its radiating grooves.

Fig. 25. Hooks on the anterior portion of the proboscis; $\frac{750}{1}$

Fig. 26. Hooks from the posterior portion of the proboscis; $\frac{750}{1}$.

Fig. 26*b*. Bodies round the opening of the proboscis; $\frac{750}{1}$.

Fig. 27. Cutaneous glands, with supporting chitinous plates, viewed from above; $\frac{600}{1}$.

Figs. 28–32. *Chatoderma militare*, n. sp.

Fig. 28. Calcareous spicule, viewed from above and in cross section; $\frac{500}{1}$.

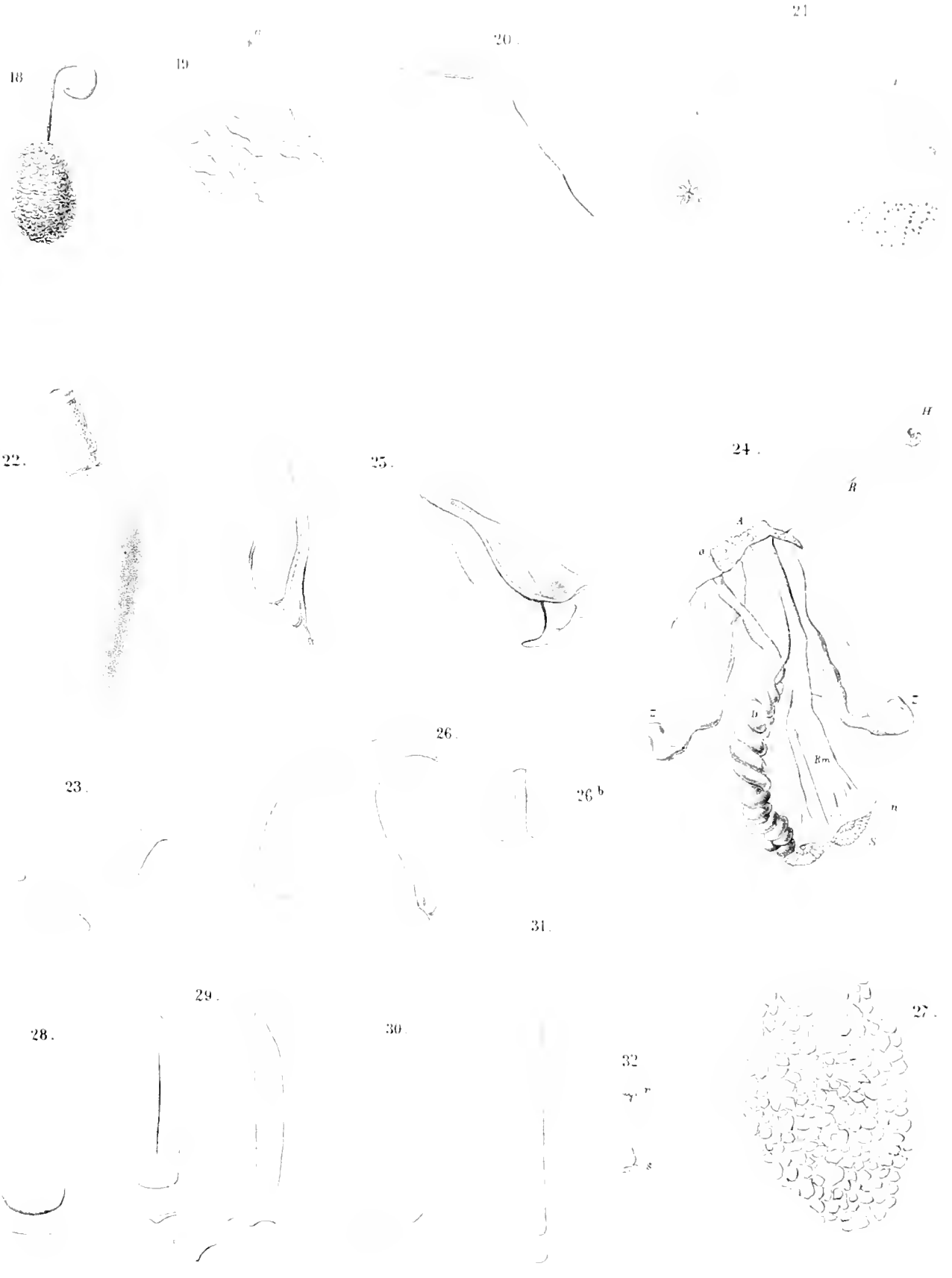
Fig. 29. Calcareous spicules from the median portion of the proboscis, viewed from above and in cross section; $\frac{500}{1}$.

Fig. 30. Prickle from the posterior portion of the proboscis and from the body; magnified 160 times.

Fig. 31. Prickle of the posterior portion of the body, from the side and in cross section.

Fig. 32. The whole animal in its natural size.

r. Proboscidal portion. | *s*. Caudal portion.



18 19 PHASCOLION SQUAMATUM KOREN & DAN. 20 PHASCOLION BOTULUS, n. sp.
21 PHASCOLION STROMBI MONT. 22-23 PHASCOLION LUTENSE, n. sp.
24-27 ASPIDOSIPHON SPECULATOR, n. sp. 28-32 CHAETODERMA MILITARE, n. sp.

THE

VOYAGE OF H.M.S. CHALLENGER.

ZOOLOGY.

REPORT on the Schizopoda collected by H.M.S. Challenger during the Years 1873–76. By Professor G. O. Sars of the University of Christiania.

INTRODUCTION.

Of the very extensive collections of Crustacea made during the Challenger Expedition, the two interesting groups, the Schizopoda and the Cumacea, have been placed in my hands, by Mr. John Murray, for examination and description.

In the present Report only the first of these groups, the Schizopoda, is treated of. The Cumacea will subsequently be described and figured in a separate Report, which will be issued as soon as possible, and to which will be appended a short Report on the Challenger Phyllocarida.

The collection of Schizopoda procured during the long voyage of H.M.S. Challenger has turned out extremely rich and of very special interest, containing, as it does, several most remarkable new types, the examination of which has led to a much fuller comprehension of the morphology of the Schizopoda and their relation to other Crustacea than we previously possessed. The various collections having been made in widely distant tracts of the ocean, an important contribution to the geographical distribution of species has likewise been acquired.

Very special regard had already been paid to this interesting group of Crustacea by the late Dr. R. v. Willemoes-Suhm, whose untimely death, during the Expedition, was so deeply deplored by his friends and the scientific world.

In a very interesting treatise on the Atlantic Crustacea from the Challenger Expedition, that appeared in the Transactions of the Linnean Society of London,[1]

[1] *Trans. Linn. Soc. Lond.* (Zool.), ser. 2, vol. i. p. 23, 1875.

this distinguished zoologist has characterised and figured, together with various other Crustacea, several striking forms of Schizopoda, that have proved to be of a truly remarkable interest, and which, in the sequel, will be more fully treated of, with due reference to the treatise of that lamented author.

Moreover, I have had the opportunity of referring to drawings and notes made by the late v. Willemoes-Suhm during the Expedition, as also to a few partly coloured sketches of Schizopoda, executed by Sir Joseph Hooker on the Antarctic Expedition in 1839–40, under the command of Sir James Clark Ross, all of which have kindly been placed in my hands by Mr. John Murray.

In a preliminary paper, published in the Transactions of the Christiania Scientific Society for 1883,[1] I have briefly characterised the new genera and species of Schizopoda from the Challenger Expedition, which are more fully described in the following Report.

Principal Works on Schizopoda.

Milne-Edwards, H., Histoire Naturelle des Crustacés, t. ii., Paris, 1837.

Bell, T., History of British Stalk-eyed Crustacea, Appendix, London, 1853.

Dana, J. D., United States Exploring Expedition—Crustacea, part i., Philadelphia, U.S.A., 1852.

Beneden, P. J. v., Recherches sur la faune littoral de Belgique—Crustacés. *Mém. Acad. Sci. Bruxelles*, t. xxxiii., 1861.

Kröyer, H., Et Bidrag til Kundskaben om Krebsdyrfamilien Mysidæ. *Nat. Hist. Tidskr.*, Række 3, Bd. i., 1861–63.

Claus, C., Ueber einige Schizopoden und niedere Malacostraken Messina's. *Zeitschr. f. wiss. Zool.*, Bd. xiii. p. 422. 1863.

——— Ueber die Gattung Cynthia als Geschlechtsform der Mysideengattung Siriella. *Zeitschr. f. wiss. Zool.*, Bd. xviii. pp. 271–279, 1868.

Sars, M., Beskrivelse over Lophogaster typicus. Universitets program, Christiania, 1862. (Trans.) *Ann. and Mag. Nat. Hist.*, ser. 3, vol. xix. pp. 461, 462, 1864.

Suhm, R. v. Willemoes-, On some Atlantic Crustacea from the Challenger Expedition. *Trans. Linn. Soc. Lond.* (Zool.), ser. 2, vol. i. pp. 23–58, 1875.

Boas, J. E. V., Studien über die Verwandtschaftsbeziehungen der Malacostraken. *Morphol. Jahrb.*, Bd. viii. pp. 485–579, 1883.

Sars, G. O., Histoire Naturelle des Crustacés d'eau douce de Norvège, 1e Livraison, Les Malacostracés, Christiania, 1867.

——— Monographe over de ved Norges Kyster forekommende Mysider, Christiania, 1870–79.

——— Middelhavets Mysider. *Archiv f. Mathem. og Naturkundskab*, Bd. i. pp. 1–111, 1876.

——— Preliminary Notices on the Schizopoda of H.M.S. Challenger Expedition. *Forhandl. Vidensk. Selsk. Christiania*, No. 7, 1883.

[1] *Vide, op. cit.*

Terminology.

Concerning the terminology, I have deemed it advisable in the present Report to make use of that best known and most generally adopted by the carcinologists of the present time, though I am well aware that the usual terms have not in all cases a clearly defined scientific character. The manifold modifications, both in structure and functions, affecting almost every part of the body in this extensive class of Arthropoda, must, in my opinion, make it very difficult, if not quite impossible, to establish any nomenclature, that at the same time would give fully adequate terms for the several parts, and also be equally applicable to all forms of the class.

The attempts made with this object in view by certain eminent carcinologists, and most recently by Mr. C. Spence Bate, do not seem to have been generally accepted by specialists in this department, notwithstanding the great skill and inventive aptitude shown in constructing the new terms suggested.

In a strict sense, I think that one of the claims to attention presented by so decidedly new a terminology would be its unquestionable applicability, not only to all forms of Crustacea, but also, as invariably has been attempted with the older one, to its embracing the other classes comprised in the vast subkingdom of the Arthropoda (Pycnogonida, Arachnoida, Myriapoda, Insecta). This, however, would appear to have been far from the object of the above carcinologists. For not only have they restricted their investigations to the class of Crustacea, but it would also appear that the several new terms have been, in every sense, specially devised for some limited group of this class, generally one of the higher ones (Decapods, Amphipods). It is obvious, therefore, that many of the terms, constructed according to such a method, will not apply even to all the Crustacea, let alone to the other Arthropoda.

Indeed, if any attempt be made to construct a new and more generally applicable nomenclature, it seems imperatively necessary that the terms should be relatively indefinite, and, as a rule, not involving the designation of any specific physiological function, but merely structural characters in a more general sense. Only within limited groups would, perhaps to a certain extent, more definite designations be applicable, but even then merely as strict specific terms.

It is obvious that several of the new terms proposed by Mr. Spence Bate are of a strictly specific character, *e.g.*, pereion, pleon, gnathopoda, pereiopoda, pleopoda, and these terms therefore cannot, in my opinion, lay any claim to serve as generally applicable designations for all the Crustacea, although they are extremely significant and sufficiently adequate for some of the higher groups. Thus any carcinologist engaged in studying the very extensive order of Copepoda would, I feel convinced, hardly adopt the terms "pereion" and "pleon" in the same sense as that proposed by Spence Bate; for in those animals the middle section of the body ("pereion"

of Spence Bate), and not the posterior, is the one properly corresponding to the "pleon," its limbs being, in every case, true pleopoda. Moreover, the zoologist who has chosen for his special study the Cladocera or the Ostracoda, would hardly be inclined to apply the term "pleon" either to the middle or the posterior section, but more likely to the anterior (cephalon), to which are attached the only true swimming limbs (antennæ).

Of the limbs belonging to the middle section of the body, Mr. Spence Bate names the two anterior pairs "gnathopoda." This certainly may be quite correct as regards a number of the higher Crustacea, and more especially the Amphipoda, but by no means for all the lower forms, and the term should therefore merely be regarded as an epithet for a peculiar modification of those limbs in a few limited groups, precisely as chelipeds, fossorial legs, prehensile legs, &c.

Even within the restricted group of the Crustacea treated of in the present Report, which belong precisely to the same division (Podophthalmia) as that on which Mr. Spence Bate will report, we find no less than four different cases in point, not one of which would coincide with the proposed terminology. Thus in all known Mysidæ, and among the Lophogastridæ, at least in the genera *Lophogaster* and *Ceratolepis*, only the most anterior pair of these limbs can properly be named "gnathopoda." In the Lophogastrid genus *Gnathophausia*, too, this pair differs so slightly from the succeeding limbs that, in a strict sense, the term "gnathopoda" even here is very inappropriate. Again, in the Euphausiidæ, not only are all the limbs of this section true legs, but even the last pair of limbs belonging to the anterior section (cephalon)—the maxillipeds—have assumed a perfectly pediform structure. On the other hand, in the genus *Eucopia* we find, exclusive of the maxillipeds, no less than three of the succeeding pairs of limbs serving as subsidiary organs for mastication, or, more properly, modified as true gnathopoda.

Moreover, the terms "pleopoda" and "pereiopoda" would not seem to be strictly applicable to all Schizopoda. Thus, the limbs of the posterior division ("pleopoda" of Spence Bate) in all female Mysidæ, without exception, and also in some male forms, are found to be so rudimentary as not to serve in any sense as swimming organs, this function being merely restricted to the outer branches (exopods) of the limbs belonging to the middle section of the body ("pereion" of Spence Bate). Nor is generally the structure of the true legs in the Schizopoda such as to make them well adapted for the function of walking, or to serve as true pereiopoda; thus, in the Euphausiidæ the delicate structure and very restricted mobility of these limbs make them wholly unfit even to support the body when at the bottom.

Under such circumstances, I have felt some hesitation in adopting for this group of Crustacea the terminology proposed by Mr. Spence Bate, although I fully admit the strict scientific character and exactness of the terms as regards the greater part of the Podophthalmia. For reasons more fully set forth above, I have deemed it advisable to follow

the earlier method, in adopting for the several sections of the body, as well as for the respective limbs, designations more indefinite in character, and consequently applicable on a wider scale.

The terms most usually adopted for the two posterior sections of the body, viz., the "thorax" and "abdomen," are certainly in this respect preferable to the much more specific designations "pereion" and "pleon" proposed by Mr. Spence Bate. But as the sections so termed for the Crustacea do not correspond with those for Insects and other Arthropods, I have thought it better to select some other known designations of a similar indefinite kind. The terms "trunk" and "tail" seem to answer the purpose sufficiently well, and both have, too, been adopted by some carcinologists.

Concerning the several limbs, I do not regard it necessary to change the well known and familiar terms "antennæ, mandibles, maxillæ," which have, moreover, to a great extent, been adopted for other Arthropods. I have likewise seen fit to retain for the pair of limbs immediately succeeding the maxillæ, the usual term "maxillipeds," more especially since these limbs, as shown by Milne-Edwards, are found to belong to the foremost section of the body, and thus in every case, even should their structure be peculiarly modified, stand in more or less close relation to the oral parts. For all the limbs belonging to the succeeding or middle section, the indefinite term "limbs of the trunk" or "legs" may, in a more general sense, be applied, and only in the case of peculiar structural differences, the more specific terms "gnathopoda, chelipeds, fossorial legs, pereiopoda, whirling legs, natatory legs, prehensile legs," &c., are to be substituted. As regards the limbs belonging to the posterior section of the body (tail), for the same reason, the general designation "caudal limbs" may be adopted, and only in particular cases the specific terms "pleopoda, setiferous lamellæ, caudal stylets, opercular and branchial lamellæ," &c. The hindmost pair of caudal limbs, differing in most cases essentially from the preceding, may perhaps be termed, in accordance with the proposal of Mr. Spence Bate, "uropoda." Together with the last caudal segment (telson) these limbs form in the higher Crustacea the so-called "caudal fan."

To facilitate comprehension of the terminology made use of in the present Report, the most essential terms are given below. A more detailed explanation would, I think, be quite superfluous.

Adult animal (female, male).
Young animal. *Larva* (Nauplius-, Zoea-, Mysis-stage).
Pupa (in Lophogastridæ and Mysidæ).

A. *Anterior division of body* (cephalon and trunk). Free segments of trunk.

Carapace.—Rostrum (frontal plate); cervical sulcus; lateral wings of carapace; dorsal area; regions; dorsal spine; supra-orbital, antennal, and branchiostegal spines.

Epistome.—*Anterior lip* (labrum).

Posterior lip (metastoma).

1. *Eyes.*—Pedicle; cornea; ocular papilla.
2. *Antennula.*—Peduncle; flagella; male appendage.
3. *Antenna.*—Basal part; terminal part (peduncle and flagellum); scale; basal spine.
4. *Mandibles.*—Body of mandible; masticatory part; cutting edge; molar protuberance; palp.
5. First pair of *maxillæ.*
6. Second pair of *maxillæ.* } Basal part; masticatory lobes; palp; exognath.
7. *Maxillipeds.*—Stem (basal part and palp); masticatory lobes; exopodite; epipodite.

8–14. *Limbs of the trunk* or *legs.*—Stem (coxal, basal, ischial, meral, carpal, propodal, terminal joints); exopod; epipod; gills; incubatory lamellæ; male sexual appendages.

Incubatory pouch (marsupium).

B. *Posterior division of body* or *tail.*—Caudal segments; epimera; præanal spine.

15–19. *Caudal limbs* (pleopoda; setiferous lamellæ; male copulatory appendages).

Terminal appendages of tail (caudal fan).

20. *Uropoda* (last pair of caudal limbs).—Basal part; terminal plates; auditory apparatus (in Mysidæ).
21. *Telson* (last caudal segment).—Terminal spines; apical incision.

Luminous globules ("accessory eyes" of earlier authors) in Euphausiidæ and *Gnathophausia* (?).

MORPHOLOGY OF THE SCHIZOPODA.

All the principal types of this group being represented in the collection made during the Challenger Expedition, it may, I think, be apposite to discuss here in what relation the Schizopoda stand to other Crustacea, and what is the systematic position to be at present assigned to these forms, as also how the group may properly be subdivided.

As is well known, Milne-Edwards, the great reformer of carcinology, ranked these Crustacea, of which, however, a few forms only had at that time been recorded, side by side with the Squillacea in his order Stomatopoda, ranging also therein the genus *Leucifer* together with certain spurious genera, that since then have been found to be only larval forms of other known Crustacea. Dana, in his great work on the Crustacea of the United States Exploring Expedition, adopts the views of Milne-Edwards as to the systematic position of the Schizopoda, ranging them in his order Anomobranchiata, which perfectly corresponds with the order Stomatopoda of the first named author; and several other carcinologists have since then done the same. Such a classification must, however, in my judgment, at present be regarded as decidedly unsatisfactory, the Schizopoda being undoubtedly much more nearly related to the Eubranchiata or Decapoda of Milne-Edwards than to the Anomobranchiata (Stomatopoda). It will, I think, be absolutely necessary to restrict the order Stomatopoda to the Squillacea only, a group of Crustacea differing in many points very materially from all other Podophthalmia, whereas the genus *Leucifer* may find its appropriate place side by side with *Sergestes*, among the lower Decapods (Penæidea). Thus the Schizopoda are either to be regarded as forming a distinct order, or to be ranged in the order of the Decapoda or Eubranchiata of Dana. The last mentioned view has also been held of late by several distinguished modern zoologists, and the striking similarity in their external form often exhibited by these Crustacea to the lower Macrura (Caridea), has even led certain of these zoologists to regard the Schizopoda as merely forming a section of that tribe of the Decapoda. In my opinion, however, it is more appropriate at present to assign to this group the rank of a distinct tribe or suborder, there being several well-marked characters distinguishing these Crustacea rather sharply from all other known Decapods.

Of such characteristics peculiar to the group, the following may be set forth :

1. The presence of strongly developed natatory branches (exopods) on all the limbs of the trunk or legs is, perhaps, the most striking feature distinguishing this group, and

that from which the designation Schizopoda has been derived. There are, it is true, some few examples of Macrurans in like manner retaining the exopods throughout the adult stage, viz., the anomalous families Ephyridæ and Pasiphaidæ, as also certain of the Penæidea; but in none of those forms do these parts exhibit the strong development peculiar to the Schizopoda, nor do they seem to have any importance as organs of locomotion.

2. As to the oral parts, may be noticed the large size of the mandibular palp, which generally even exceeds in length the body of the mandible itself. The maxillæ, too, also exhibit a rather peculiar appearance, different from what is observed in any true Macruran. It may, however, be remarked, that the oral parts in the Euphausiidæ differ in several respects very materially from those in other Schizopoda.

3. Of the legs, as a rule, only the foremost pair are developed as true gnathopoda, whereas all the others generally exhibit a very uniform structure, none of them being, as is the case in other Podophthalmia, modified to cheliform or prehensile organs. In the Euphausiidæ, too, not only are all the legs as a rule uniform, but even the maxillipeds are quite pediform in structure. The genus *Eucopia* exhibits, it is true, in this respect a very striking anomaly; it appears, however, that the very peculiar structure of the legs in that genus is quite as different from what is typical in the higher Podophthalmia.

4. The mode in which the ova are borne in the females differs essentially from what has been observed in any other known form of Podophthalmia. In those Crustacea, as is well known, the caudal limbs (pleopoda) serve for affixing the roe, whereas in the Schizopoda the ova are invariably placed beneath the trunk, generally enclosed within a pouch, or marsupium, consisting, as in Amphipods and Isopods, of a certain number of lamelliform leaflets, issuing from the bases of the legs. True, in the Euphausiidæ, incubatory lamellæ are wanting; but even here the position of the ova beneath the trunk is precisely the same as in other Schizopoda.

5. The development of most Schizopoda exhibits a very striking resemblance to that of the Isopoda, the young passing within the marsupium of the female through one or more so-called pupa-stages before being hatched. In the Euphausiidæ, however, a totally different mode of development has been discovered, the young of these animals being hatched in a very immature condition, and not attaining, till after an exceedingly complicated free metamorphosis, the form characteristic of the adults.

The Schizopoda occupy, as it were, the most primitive position within the division of the Podophthalmia, being apparently the least modified forms, in which the original characters distinguishing the progenitors of the whole division would seem to exhibit least change. This view derives, too, undeniable confirmation from the fact that a vast number of the higher Podophthalmia (Macrura, Caridea) pass during development through a larval stage—the so-called Mysis-stage—calling to mind in a most striking manner the Schizopod type.

The suborder Schizopoda, as far as at present known, may be divided into four natural sections or families, viz., the Lophogastridæ, Eucopiidæ, Euphausiidæ, and Mysidæ. These families are comparatively well defined, exhibiting on the whole very marked differences, both in the external appearance and in several of the anatomical details, and also partly in development.

The most highly organised Schizopoda are undoubtedly the Lophogastridæ, whereas the lowest forms are comprised within the family Mysidæ. The Eucopiidæ would appear on the whole—notwithstanding the peculiar structure of the legs—to be those most nearly related to the Lophogastridæ. Somewhat more divergent are the Mysidæ, which form an exceedingly rich and at the same time well-defined group of Schizopoda. The fourth family, the Euphausiidæ, occupies in many respects rather an isolated position within the suborder; thus, the many remarkable peculiarities distinguishing these forms have led Dr. Boas[1] to exclude them wholly from the Schizopoda, and to establish for their reception a perfectly distinct order, which, in the opinion of that author, is the one most nearly allied to the remarkable and anomalous Crustacean *Nebalia*. Although in most points I fully entertain the views set forth in the very interesting treatise of Dr. Boas on the affinity of the higher Crustacea, and also admit the significance of the divergencies distinguishing the Euphausiidæ from both the Mysidæ and the Lophogastridæ, I am by no means prepared to agree with him in excluding these families from the Schizopoda. In their whole external form and appearance they are true Schizopods, whereas in these respects they do not show any resemblance to the genus *Nebalia*. This form, too, in my opinion ought to be retained within the order Branchiopoda, representing there, however, a separate section or suborder (Phyllocarida), which in some respects exhibits a perplexing affinity to higher types of Crustacea.

[1] Studien über die Verwandtschaftsbeziehungen der Malacostraken, *loc. cit.*

DEFINITIONS OF THE FAMILIES.

The four families of Schizopoda above mentioned may be briefly characterised as follows :—

1. Lophogastridæ.

Carapace rather large, more or less calcareous; its posterior part but loosely covering the trunk, all segments of which are well defined dorsally. Maxillipeds robust, with the exopodite imperfectly developed, the epipodite very large and projecting within the branchial cavity. First pair of legs more or less distinctly modified as gnathopoda, remaining pairs uniform and ambulatory, with well-marked dactylus. Branchiæ (arthrobranchiæ) very complex, arborescent, consisting of three or four principal branches, the innermost largest and freely projecting beneath the trunk, the remaining branches covered by the carapace, posterior pair rudimentary or wanting. Marsupium in female composed of seven pairs of incubatory plates. Caudal limbs well developed in both sexes and of uniform structure, natatory. Development without any free metamorphosis.

Genera.

1. *Lophogaster*, M. Sars.
2. *Ceratolepis*, G. O. Sars.
3. *Gnathophausia*, Suhm.
4. *Chalaraspis*, Suhm (*ex parte*).

2. Eucopiidæ.

Carapace very large, membranous, the lateral wings produced and projecting over the base of the tail. Segments of trunk all well defined. Maxillipeds nearly the same as in the Lophogastridæ. Legs dissimilar in structure, the three anterior pairs modified to serve as gnathopoda, the three succeeding pairs extremely slender, filiform, with the dactylus falciform and very mobile, last pair simple, not prehensile. Branchiæ, marsupium, and caudal limbs nearly the same as in the Lophogastridæ. Development ?

Genus.

Eucopia, Dana.

3. Euphausiidæ.

Carapace rather small, not calcareous, firmly connected with the trunk along the dorsal face, leaving only part of the last segment closed above. Maxillipeds elongate, pediform, with the exopodite well developed, natatory, the epipodite rudimentary or wanting.

Legs generally uniform in structure, not adapted for walking, geniculate and densely setose, without any distinct dactylus; posterior pairs more or less imperfectly developed. Branchiæ (podobranchiæ) wholly uncovered, digitiform-arborescent, the posterior pairs rather complex, sending off a branch beneath the trunk. Egg-pouch, when present, placed beneath posterior part of trunk, single or double, not formed by any incubatory lamellæ. Caudal limbs strongly developed in both sexes, natatory, inner plate provided with a secondary lobe, and in the male modified on the first two pairs as copulative organs. Luminous globules of complicated structure generally present on both the anterior and posterior divisions of the body. Propagation by means of spermatophores. Development very complex, the free larva passing through the Nauplius and Zoëa-stages.

Genera.

1. *Euphausia*, Dana.
2. *Thysanopoda*, M.-Edw.
3. *Bentheuphausia*, n. gen.
4. *Nyctiphanes*, G. O. Sars.
5. *Boreophausia*, n. gen.
6. *Thysanoëssa*, Brandt.
7. *Nematoscelis*, G. O. Sars.
8. *Stylocheiron*, G. O. Sars.

4. Mysidæ.

Carapace generally rather small; its posterior part only loosely covering the trunk, the segments of which are distinctly defined, although very narrow and crowded together in the dorsal part. Maxillipeds strong, with the exopodite well developed, natatory, epipodite lanceolate and projecting within the branchial cavity. First pair of legs modified as gnathopoda, the remaining legs uniform and generally of rather feeble structure, the terminal part being in most cases subdivided into short setiferous articulations, the dactylus, as a rule, small or wanting. No true branchiæ present. Marsupium in most of the genera composed of only two or three pairs of incubatory lamellæ, issuing from the bases of the hindmost pair of legs. Caudal limbs in female quite rudimentary, not adapted for swimming; in male either natatory or some of them modified to serve as copulative organs. Inner plate of uropoda generally containing within its base a peculiarly developed auditory apparatus. Development without any free metamorphosis.

Genera.

1. *Petalophthalmus*, Suhm.
2. *Boreomysis*, G. O. Sars.
3. *Amblyops*, G. O. Sars.
4. *Pseudomma*, G. O. Sars.
5. *Erythrops*, G. O. Sars.
6. *Parerythrops*, G. O. Sars.
7. *Anchialus*, Krøyer.
8. *Mysidopsis*, G. O. Sars.
9. *Leptomysis*, G. O. Sars.
10. *Siriella*, Dana.
11. *Mysideis*, G. O. Sars.
12. *Promysis*, Dana.
13. *Enchatomera*, G. O. Sars.
14. *Hemimysis*, G. O. Sars.
15. *Mysis*, Thompson.
16. *Macropsis*, G. O. Sars.
17. *Mysidella*, G. O. Sars.
18. *Heteromysis*, Smith.

LIST OF THE SPECIES.

The following is a list of the species of Schizopoda procured during the Challenger Expedition :—

LOPHOGASTRIDÆ.

1. *Lophogaster typicus*, M. Sars.
2. *Ceratolepis hamata*, G. O. Sars.
3. *Gnathophausia ingens* (Dohrn).
4. „ *gigas*, Suhm.
5. „ *calcarata*, G. O. Sars.
6. „ *willemoesii*, G. O. Sars.
7. „ *affinis*, G. O. Sars.
8. „ *elegans*, G. O. Sars.
9. „ *zoëa*, Suhm.
10. „ *longispina*, G. O. Sars.
11. „ *gracilis*, Suhm.
12. *Chalaraspis alata*, Suhm, M.S.

EUCOPHIDÆ.

13. *Eucopia australis*, Dana.

EUPHAUSIIDÆ.

14. *Euphausia pellucida*, Dana.
15. „ *similis*, G. O. Sars.
16. „ *splendens*, Dana.
17. „ *murrayi*, G. O. Sars.
18. „ *superba*, Dana.
19. „ *antarctica*, G. O. Sars.
20. „ *mucronata*, G. O. Sars.
21. „ *gracilis*, Dana.
22. „ *gibba*, G. O. Sars.
23. „ *spinifera*, G. O. Sars.
24. „ *latifrons*, G. O. Sars.
25. *Thysanopoda tricuspidata*, M.-Edw.
26. „ *obtusifrons*, G. O. Sars.
27. „ *cristata*, G. O. Sars.
28. *Thysanopoda microphthalma*, n. sp.
29. *Bentheuphausia amblyops*, G. O. Sars, n. gen.
30. *Nyctiphanes australis*, G. O. Sars.
31. *Thysanoëssa gregaria*, G. O. Sars.
32. „ *macrura*, G. O. Sars.
33. *Nematoscelis megalops*, G. O. Sars.
34. „ *microps*, G. O. Sars.
35. „ *tenella*, G. O. Sars.
36. „ *rostrata*, G. O. Sars.
37. *Stylocheiron carinatum*, G. O. Sars.
38. „ *suhmii*, G. O. Sars.
39. „ *longicorne*, G. O. Sars.
40. „ *elongatum*, G. O. Sars.
41. „ *abbreviatum*, G. O. Sars.

MYSIDÆ.

42. *Petalophthalmus armiger*, Suhm.
43. *Boreomysis scyphops*, G. O. Sars.
44. „ *obtusata*, G. O. Sars.
45. „ *microps*, G. O. Sars.
46. *Amblyops crozetii*, Suhm, M.S.
47. „ *australis*, G. O. Sars.
48. *Pseudomma sarsii*, Suhm, M.S.
49. *Anchialus typicus*, Kröyer.
50. „ *angustus*, G. O. Sars.
51. „ *pusillus*, n. sp.
52. *Mysidopsis* (?) *incisa*, G. O. Sars.
53. *Siriella thompsonii*, M.-Edw.
54. „ *gracilis*, Dana.
55. *Euchætomera typica*, G. O. Sars.
56. „ *tenuis*, G. O. Sars.
57. *Heteromysis bermudensis*, n. sp.

DESCRIPTION OF GENERA AND SPECIES.

Order PODOPHTHALMIA.

Suborder SCHIZOPODA.

Family 1. LOPHOGASTRIDÆ.

This family, formerly represented only by a solitary genus, *Lophogaster*, has acquired a very considerable augmentation by the material collected during the Challenger Expedition, three interesting new genera having been added, one of which (*Gnathophausia*) is represented by no less than nine different species.

I have placed this family at the head of the suborder, since it would seem to comprise the most highly organised forms of Schizopoda. This may easily be shown by comparing the structure and development of the several organs with the corresponding ones in other Schizopods, and especially by examining the branchial apparatus, the highly differentiated structure of which gives full evidence of the high rank occupied by these forms. The fact that by far the largest and most powerfully developed species are to be found in the present family, would seem also to support such a view.

The late Professor M. Sars, my father, had already stated that the genus *Lophogaster*, which constitutes the type of this family, exhibits in several respects a striking affinity to some of the lower Macrura (Caridea). Exclusive of the strong development of the gills, may also be noted the structure of the integuments, which are more or less calcified or indurated, and in some cases even exhibit a distinctly perceptible sculpture, not to be found in any other Schizopods; moreover, the comparatively powerful structure of the legs renders those organs apparently more efficient for the office of true pereiopoda, than is the case with the other known forms of this suborder. From the Macrura they may, however, be easily distinguished, not only by the incubatory pouch of the females, but also by the uniformly developed biramous legs, none of which exhibit any trace of a cheliform or even subcheliform structure.

A synopsis of the four genera comprised in this family is given below:—

- Carapace
  - covering only the anterior division of the body. Rostrum
    - short, forming together with the supra-orbital spines a broad tridentate frontal plate. Antennal scale
      - broad, cordiform, with the inner edge setose, . . . *Lophogaster*.
      - narrow, flexuous, without marginal seta, . . . *Ceratolepis*.
    - more or less produced, spear-shaped, denticulate, *Gnathophausia*.
  - covering whole of the anterior division of the body and part of posterior, . *Chalaraspis*.

Genus 1. *Lophogaster*, M. Sars, 1856.

Lophogaster, M. Sars, Forhandl. Skand. Naturf., Möde i Christiania, 1856, p. 160.
Ctenomysis, Norman, Rep. Brit. Assoc., 1861, p. 151.

Generic Characters.—Carapace distinctly sculptured, forming anteriorly a broad tridentate frontal plate, posterior margin deeply emarginate in the middle, leaving last segment of trunk wholly exposed above, lateral wings produced, pointed. Caudal segments with well-defined lamellar epimera, last segment subdivided by a transverse suture. Eyes globular, partly covered by the frontal plate. Antennular peduncle very short and thick, inner flagellum small, outer remarkably strong and elongate. Antennal scale cordiform, outer edge serrate, inner setose. First pair of maxillæ without any palp, second pair with only two masticatory lobes; palp comparatively small. First pair of legs (gnathopoda) with terminal joint obtusely rounded and densely hirsute. The remaining legs rather robust, with strongly developed dactylus. Branchiæ tripartite, the branches regularly bipinnate, and each pinnula exhibiting a double series of small leaflets. Telson produced, with apex entire, and armed with strong terminal spines. Outer plate of uropoda not subdivided at extremity, outer edge straight, and terminating in a small dentiform projection.

Remarks.—In the above diagnosis I have made an attempt to arrange together several characters, that in my opinion should be regarded as peculiar to the present genus, when compared along with the three new genera brought to light by the Challenger Expedition. The genus which, as that first established, may be taken to be the type of the family, is as yet represented only by a single species, *Lophogaster typicus*, formerly regarded exclusively as a northern form, but now having also been met with during the Challenger Expedition, proved to exhibit a very wide geographical distribution.

1. *Lophogaster typicus*, M. Sars (Pl. I. figs. 1–7).

Lophogaster typicus, M. Sars, Forhandl. Skand. Naturf., Möde i Christiania, 1856, p. 160.
Ctenomysis dilata, Norman, Rep. Brit. Assoc., 1861, p. 151.
Lophogaster typicus, M. Sars, Univ. Progr., 1862.

Of this interesting Schizopod, fully described by the late Professor M. Sars, there are three more or less complete specimens in the Challenger collection, from two Stations, at no great distance apart, both south of the Cape of Good Hope. One of the specimens is a full-grown male, the other two (one of which is defective) are females.

I have most carefully compared these specimens with the form occurring on the Norwegian coast, without, however, having detected any distinctive character warranting the assignment of specific difference, and hence I am obliged to regard them as belonging to the typical species, notwithstanding the remarkable fact of their occurrence in a locality so widely distant from the Norwegian Sea.

To show the correctness of this assumption, and at the same time afford other zoologists an opportunity of instituting a comparison, I have given on the first Plate of the present Report figures of the Challenger specimens, and subjoin the following descriptive notes.

The male specimen (fig. 1) has a length of 25 mm., and is distinguished from the female (fig. 2) by a somewhat more powerful development of the tail, as also by the greater length of the outer antennular flagellum.

The broad frontal plate, which is hollowed in the centre (fig. 3), has the median tooth (rostrum) rather short, not exceeding in length the lateral teeth (supra-orbital spines), and covers, as in the Norwegian form, not only a great part of the antennular peduncles, but also the bases of the globular eyes, forming here a kind of imperfect orbit.

The antennal scale (fig. 3) exhibits the peculiar cordiform shape characteristic of the species, but in the present specimen is distinguished by the unusually small number of teeth (only three) on the outer margin.

Having examined a series of Norwegian specimens, I find, however, that the number of teeth along the outer edge of the antennal scale, as well as the relative length of the teeth on the frontal plate, is subject to a rather considerable variation. This, too, is obvious on comparing the male specimen here described with the two other specimens procured from the Challenger Expedition, which are both females.

One of these females, the most perfect, is represented in fig. 2, viewed from above. It has a length of 18 mm., and thus is somewhat smaller than the male specimen, a fact in accordance with that observed in the Norwegian forms, the females of which are, as a rule, considerably smaller than the adult males.

It will be observed, that the median tooth of the frontal plate in this specimen is rather more produced than the lateral teeth, reaching almost to the end of the antennular peduncle. Moreover, the number of teeth along the outer edge of the antennal scale (fig. 4) is greater, as many as five having been counted.

Of the legs, I have figured one belonging to the last pair (fig. 5) in the imperfect female specimen. On comparing this figure with the one given by my father of the same leg in a Norwegian specimen[1] the resemblance between the two is very striking.

The caudal fan (fig. 6) also exhibits in all its details the most perfect agreement with that of the Norwegian form. The telson, considerably exceeding in length the uropoda, is scooped out dorsally along the middle, exhibiting two parallel longitudinal carinæ, most prominent in the posterior part. It tapers gradually towards the apex, and, a little posterior to the middle, is provided on either side with three small lateral denticles. To the truncate extremity of the telson are attached four strong spines, and a little anterior to them is observed another somewhat smaller spine on either side. In

[1] See Univ. Progr., pl. ii. fig. 36.

the middle, between the two larger apical spines, projects moreover a thin and finely serrate lamella, to the lower side of which are attached two delicate diverging bristles. This serrate lamella is not figured distinctly in the work of the late Professor M. Sars, although it is mentioned in the text. However, on re-examining the Norwegian form I have found it to be present, and in form and armature of precisely the same appearance as in the specimen here figured (fig. 7).

Habitat.—The specimens procured by the Challenger Expedition were collected at the following Stations:—

Station 141, December 17, 1873; lat. 34° 41′ S., long. 18° 36′ E.; depth, 98 fathoms; green sand; bottom temperature, 49°·5.

Station 142, December 18, 1873; lat. 35° 4′ S., long. 18° 37′ E.; depth, 150 fathoms; green sand; bottom temperature, 47°·0.

The present species occurs rather abundantly along the southern and western coasts of Norway at a depth of from 20 to 100 fathoms, and has also been recorded from the Shetland Isles by the Rev. Dr. Norman (= *Ctenomysis alata* of that author).

It may be regarded as a true bottom-form, never having been found at the surface of the sea, as is the case with some other Schizopods.

Distribution.—Concerning the geographical distribution of the species, the occurrence of this form in the southern hemisphere, as shown by the Challenger collection, is remarkable, and might induce the belief that it ranges from the Norwegian Sea along the whole western coast of Europe and Africa, or throughout the boreal, lusitanic, tropic, and antiboreal regions. It may, however, be considered as a highly remarkable fact, that this very striking form has never been recorded either from the coasts of England and France, or from the Mediterranean, although each of these tracts has been carefully investigated by numerous zoologists. We may therefore entertain the assumption that this form in reality does not occur throughout the intermediate tracts of the ocean, but is met with independently in both hemispheres in the corresponding region. Should this be the case, we may infer that the distribution of the species must at an earlier date have been continuous, but considerable changes afterwards occurring in the physical conditions led to a separation of the species into two independent stocks. In the sequel we shall meet with another still more striking example of a similar kind, in treating of the Mysidian *Boreomysis scyphops*, a form stated to occur in the Arctic and Subantarctic regions only, having never yet been found in any intervening tract.

Genus 2. *Ceratolepis*, G. O. Sars, 1883.

Ceratolepis, G. O. Sars, Preliminary Notices on the Challenger Schizopoda.

Generic Characters.—Carapace highly indurated and very large, covering the whole of the anterior division of the body, posteriorly abruptly truncate, not emarginate, anteriorly forming a broad tridentate frontal plate, as in *Lophogaster*. Caudal segments comparatively short and narrow, with small epimera; the last not subdivided by any transverse suture. Antennulæ similar to those of *Lophogaster*. Antennal scale very peculiar, forming a narrow flexuous plate of firm consistence, without any trace of marginal bristles. Legs of comparatively more feeble structure than in *Lophogaster*, first pair modified so as to form gnathopoda, last pair (in female) without natatory branches. Telson bifid, without distinctly articulated spines. Uropoda very small, the terminal plates uniform, lanceolate and setose on both margins.

Remarks.—This new genus is obviously rather closely related to *Lophogaster*, differing however, in addition to other characters, very distinctly in the form of the carapace, the very remarkable structure of the antennal scale, the want of distinctly developed exopods on the last pair of legs, and finally in the structure of the telson and uropoda. The genus comprises at present but a single species, of which a solitary specimen only was collected by the Expedition.

2. *Ceratolepis hamata*, G. O. Sars (Pl. I. figs. 8–17).

Ceratolepis hamata, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 2.

Specific Characters.—Form of body rather short and robust. Carapace slightly nodulose above, with the dorsal area distinctly marked. Median tooth of the frontal plate conically produced, and reaching to the end of the antennular peduncle, lateral teeth much shorter and somewhat deflexed. Epimera of the caudal segments finely serrated on the posterior margin. Last segment jutting out posteriorly into four rather large projections, two lateral and two terminal, the latter embracing the base of the telson. Eyes rather small, almost wholly covered above by the frontal plate. Antennal scale considerably projecting in front of the antennular peduncle, slightly curved outward and somewhat dilated at the apex, forming there two acute angles, the one pointing forward, the other recurved in the shape of a hook; internal margin angular in the middle. Telson deeply cleft at the apex, terminal lobes acuminate and diverging. Length, 12 mm.

Remarks.—The species here treated of being the only one yet established in the genus *Ceratolepis*, it is no easy matter to decide with certainty what characters should be regarded as of specific significance. I have, however, sought in the above diagnosis to adduce some few distinctive peculiarities, that may perhaps be of weight in this respect.

Description.—The specimen examined is a female, and may be assumed to be nearly full grown, since the incubatory lamellæ are distinctly perceptible beneath the trunk, though still rather small, and not as yet forming any marsupium. The length, too, of the animal does not exceed 12 mm., and hence this form would appear to be the smallest of the known Lophogastridæ.

The general form of the body (see figs. 8 and 9) is comparatively short and thickset, resembling on the whole that of *Lophogaster*, with this difference, however, that the anterior division, owing to the strong development of the carapace, appears somewhat larger when compared with the posterior.

Contrary to what is usually found to be the case in Schizopods, the integuments are remarkably firm and highly indurated, giving to the whole body a peculiar rigidity, somewhat resembling the higher forms of Macrura.

The carapace is of very considerable size, fully equalling in length the tail, if the telson be excluded. It completely covers the whole anterior division of the body in such a manner that none of the segments of the trunk are dorsally exposed. Its surface is rather uneven, exhibiting, more particularly in the upper part, a peculiar rugged or wrinkled aspect (see fig. 8). A distinctly impressed line marks off above, as in *Lophogaster*, a somewhat linguiform dorsal area, terminating about the beginning of the posterior fourth of the carapace. Posteriorly to this area, and laterally, the carapace covers the trunk but loosely, whereas within the area it forms the immediate wall of the body. Anteriorly, the carapace projects as a broad, horizontally extending frontal plate, covering the eyes and a great part of the antennular peduncles, as in *Lophogaster*. This plate juts out in the middle as a conical process, reaching to the end of the antennular peduncle, and more properly answering to the rostrum. The lateral edges of the frontal plate (the supraorbital spines) form similar processes, though somewhat shorter and more deflexed (see fig. 8). The inferior margins of the carapace are but very slightly arcuate, and terminate anteriorly almost in a right angle. The posterior margin, too, is abruptly truncate, not as usual emarginate in the middle, and the lateral wings of the carapace do not project at all posteriorly.

The posterior division of the body, or tail, is comparatively short and narrow, exhibiting dorsally a similar rugged appearance to the carapace, the median part of every segment being rather convex, whereas at both extremities a distinctly perceptible transverse impression occurs. The epimera are rather small, of an obtusely triangular form, and finely serrated at the posterior margin toward the apex (fig. 16). The first segment has on either side an anteriorly pointing projection, fitting in beneath a short corresponding lateral keel on the posterior part of the carapace when the tail is fully extended (see fig. 8). The last segment is not much longer than the preceding, but rather narrower. It has no trace whatever of the transverse suture observed in *Lophogaster*, but exhibits posteriorly on either side a strong

triangular projection, as also two posteriorly curved mucroniform spines, embracing the base of the telson.

The eyes (see fig. 10) are comparatively small, and almost wholly covered above by the frontal plate, without, however, being lodged, as it were, within orbital hollows, as in *Lophogaster*. The cornea occupies a comparatively small part of the eyes, and does not exhibit any appreciable dilatation; its pigment is dark, and the visual elements are normally developed.

The antennular peduncle (fig. 11, a^1) is short and thick, not, however, to such an extent as in *Lophogaster*. The last joint does not exceed the basal in length, while in *Lophogaster* it is even larger than the two remaining joints taken together. As in the latter genus, the basal joint is somewhat applanated, and projects exteriorly as a pointed lappet. Of the flagella, the inner is very small, scarcely more than half as long as the peduncle, and composed of rarely more than ten short articulations. The outer flagellum, too, would seem to have been much more strongly developed, but its length cannot be exactly stated, the terminal part having been broken off in the specimen examined.

The basal part of the antennæ (see fig. 11) is thick and highly chitinised, forming on the external side a keeled prominence. The terminal part (a^2) is of the same structure as in *Lophogaster*. On the other hand, the scale (fig. 11, *sq*; fig. 12) exhibits a totally different and very peculiar appearance. It is almost twice as long as the antennular peduncle, and has the form of a very narrow, strongly chitinised, and somewhat flexuous plate, without any trace of the usual marginal bristles, but provided with several strong angular projections. The exterior part of the plate is rather prominently curved outwards and somewhat dilated at the apex, which projects in two acute angles, the one pointing straight forward, the other recurved in the shape of a hook. In the middle, the inner edge of the plate forms a similar recurved projection, and in front of this may be observed another short angular prominence. As regards both form and structure, this scale is wholly dissimilar to anything observed in other known Podophthalmia, and hence it undoubtedly represents one of the features most characteristic of the genus.

Concerning the oral parts, they would appear, on the whole, so far as they admit of being examined in the only specimen obtained, to agree with those in *Lophogaster*. Viewed from below (fig. 11), the following parts may be more or less distinctly observed within the comparatively very broad buccal area; anteriorly, on the median line appears the galeate anterior lip (*L*), and on each side the mandibles (*M*), with their palps (*p*), which are very elongate and slender: posterior to the mandibles are the maxillæ, of which, however, only the second pair admit of being partly examined, their exognaths (mx^2) being wholly exposed and rather large, elliptic, and fitting into a semicircular opening, that leads to the branchial cavity; they are as usual fringed with a row of strong ciliated bristles. The maxillipeds (*mp*) marking off posteriorly the buccal area,

exhibit a structure perfectly similar to that in *Lophogaster*, the exopodite here also being imperfectly developed, forming only a very small setous lamella (*x*).

The first pair of legs (fig. 13), as in *Lophogaster*, differ perceptibly from the remaining pairs, being somewhat more robust in structure, and having the terminal joint not unguiform, but of an oval shape, and densely beset with bristles. Hence this pair may properly be regarded as true gnathopoda.

The remaining legs (fig. 14) are all true pereiopoda, but have comparatively a more feeble structure than in *Lophogaster*, with the carpal joint more elongate, whereas the terminal one, or dactylus, is much shorter.

The last pair of legs (fig. 15) are chiefly distinguished by the want of natatory branches or exopods, in the place of which only a diminutive setous tubercle is to be seen. This, however, may perhaps be a characteristic peculiar to the females.

The caudal limbs (see fig. 8) are normally developed, and do not seem to differ essentially in structure from those in *Lophogaster*.

The telson (fig. 17) somewhat exceeds in length the two preceding segments taken together, and exhibits a form similar to that in *Lophogaster*, but differs materially in the apex not being entire but deeply cleft, or produced into two acuminate and diverging lappets, somewhat resembling the tail of a swallow. The inner edge of these terminal lappets is indistinctly serrated. For the rest every trace of spines or bristles is entirely wanting.

The uropoda (fig. 17) are most unusually small, being scarcely half as long as the telson, and with both their terminal plates of a uniform appearance, lanceolate, and setose on both margins.

Habitat.—The solitary specimen described above I found in a small bottle containing Euphausiidæ, larvæ of Macrura, and certain other pelagic animals, all of which, as shown by the label, were collected at the surface of the sea in the Pacific Ocean, between Api (New Hebrides) and Cape York (Australia).

This occurrence, certainly, is very remarkable, since none of the other Lophogastridæ are known to lead a pelagic existence. Indeed, judging from the organisation of the present species, and more especially the very firm and highly indurated integuments, one would indeed be induced to regard it as still more decidedly a bottom form than most of the other Schizopods.

Genus 3. *Gnathophausia*, Willemoes-Suhm. 1879.

Gnathophausia, Suhm, Trans. Linn. Soc. Lond., ser. 2, vol. i.

Generic Characters.—Integuments generally not very firm, parchment-like. Carapace rather large, in the greater part of its length only loosely covering the trunk, and exteriorly provided with raised longitudinal keels. Rostrum more or less elongate and

slender, spear-shaped, three-edged, denticulate. Hinder part of carapace for the most part drawn out dorsally into a posteriorly pointing spine. Caudal segments narrow, with small, bilobed epimera; the last subdivided transversely. Eyes well developed, with a small papilla issuing from the pedicle anteriorly. Antennular peduncle short and thick, outer flagellum greatly produced, riband-shaped. Antennal scale of somewhat varying form in different species. First pair of maxillæ provided with a biarticulate, setous palp, completely recurved posteriorly. Second pair exhibiting at the base exteriorly a pigmented protuberance (luminous organ?); anterior masticatory lobe cleft to the base into two very narrow lappets; palp rather large. Maxillipeds having exopodite either very small or entirely wanting. Legs slender, nearly uniform, ambulatory; first pair differing very slightly from the rest. Branchiæ divided into four bipinnate ramifications, pinnulæ exhibiting irregularly disposed, digitiform lobules. Telson very large, constricted near the base, lateral edges densely spinulous, apex armed with two strong curved spines connected at the base. Uropoda with the outer plate broader than the inner, and having a short dentiform projection at the end of the outer margin, the terminal lobe being marked off by a distinct transverse suture.

Remarks.—Of the earlier known Schizopods, *Lophogaster* certainly comes nearest to the present interesting genus, first established by the late Dr. v. Willemoes-Suhm, and I fully agree with that author in including it in the same family with that genus. On the other hand, it will appear from the diagnosis given above, that the genus here treated of exhibits several very striking features, distinguishing it rather clearly from the other Lophogastridæ. Moreover, the general appearance will be found to diverge a good deal from that observed in the two preceding genera.

To our knowledge of the present remarkable genus a very important contribution has been furnished by the Challenger Expedition, no less than nine different species being represented in the collection. Of these species, only one, *Gnathophausia ingens*, had been recorded at an earlier date; all the remaining species were first discovered during the course of the Expedition.

With a view of obtaining a clearer survey of the organisation of this interesting type, I have deemed it advisable to give a general description of the genus, previously to characterising the several species comprised therein.

General Description of the Genus.—The form of the body (see figures given in Pls. II. to VII.) will be found to vary somewhat in the different species, mainly owing to the more or less prominent development of the carapace. In all the species, however, the tail is very slender, almost cylindrical in form, and its segments provided with rather small epimera, divided into two more or less produced lappets. The last segment exhibits, as in *Lophogaster*, an obliquely transverse suture, thus apparently subdividing it into two sections, the anterior of which is provided with a pair of imperfectly developed, and, in some species very peculiarly formed, epimera.

The carapace in all the species is rather large, almost covering the whole anterior division of the body, not, however, being connate, only to a rather limited extent. When viewed from above it exhibits anteriorly (see Pls. II., III., IV., V. fig. 2) a short linguiform area, sharply marked off behind by a curved line. This dorsal area projects from the so-called stomachal region, and generally does not even reach posteriorly the middle of the carapace. Only within this restricted area, and in front of it, does the carapace constitute the true body-wall; behind it covers, though very loosely, the trunk, all the segments of which appear well developed in their whole circumference, and exhibit a rather uniform aspect (see Pl. VIII. fig. 17). Thus the greater part of the carapace, as in the genus *Nebalia*, would appear to form, so to speak, merely a loose mantle arching the back and sides of the trunk, and within which the body is freely movable; a character also regarded by the late Dr. v. Willemoes-Suhm as more particularly distinguishing the present type. This mantle-like portion of the carapace, likewise found, though generally less prominently developed, in the other Lophogastridæ, as also in *Eucopia* and in the Mysidæ, exhibits in *Gnathophausia* on each side two more or less well-marked longitudinal keels, dividing this part into five areas, the odd one in the middle, limited by both of the upper keels, with a lateral area on each side, between the upper and lower keels, finally a much smaller marginal area, extending between the lower keel and the free edge of the carapace, the last being strongly inflected toward the ventral face. The lateral areas occupying most of the sides of the carapace, are bounded anteriorly by an obliquely descending elevated line, corresponding, in position, with the branchiostegal line of the higher Podophthalmia, and terminating just above the buccal area. Immediately below this line, the carapace forms a more or less marked lateral expansion, jutting out in some species into a strong, exteriorly pointing projection, which I regard as the branchiostegal spine.

Viewed from below (see Pl. IV. figs. 3 and 4), the free margins of the carapace will be found to exhibit on each side a deep, nearly semicircular emargination, into which the exognath of the second pair of maxillæ fits. Moreover, this emargination is bounded anteriorly as well as posteriorly by an obtuse linguiform lobe bent inwards; the anterior lobe partly overlaps the body of the mandible, whereas the posterior lobe inclines toward the base of the maxillipeds. Immediately anterior to the above mentioned lateral expansion of the carapace, a strong spine projects in most of the species, pointing obliquely forward, which, as to its position on the side of the basal part of the antennæ, may properly be regarded as the antennal spine. Finally, just above the eyes, or on each side of the base of the rostrum, the frontal part of the carapace usually juts out into a similar, and often rather strongly developed spine, undoubtedly corresponding to the supraorbital spine in other Podophthalmia.

The rostrum is generally rather elongate and slender, though sometimes very broad

at the base, spear-shaped, more or less straight and horizontally projecting, and terminating in a sharp point. It has, also, three denticulate keels, one dorsal and two lateral, a transverse section thus exhibiting a triangular form. Moreover, the dorsal keel of the rostrum is produced posteriorly along the upper face of the carapace, being, however, in some species interrupted in the middle part. It always reappears in the hindmost region of the carapace, generally running out here as a more or less produced, posteriorly directed, spine (the dorsal spine). The lateral wings of the carapace, too, in some few species are produced as similar posteriorly pointing spines, very highly developed in the form described below as *Gnathophausia calcarata* (see Pl. IV.); in most of the species, however, these parts are evenly rounded off.

The eyes in all known species are distinctly developed, although of somewhat variable form, being sometimes very narrow, sometimes strongly dilated at the end, or pyriform. On the upper side of the pedicle is invariably to be observed a small papillar prominence (the ocular papilla). The eye-pigment is of a dark colour, and the visual elements would seem to be normally developed.

The antennular peduncle (see Pl. VIII. fig. 1) is rather short and thick, though somewhat less so than in the two preceding genera. The basal joint is slightly flattened, and projects on the outer side at the apex as an obtuse bristle-beset angle. The second joint is very short, almost discoidal, with an elevated crest running transversely over the upper side. The last joint, almost square in form, exhibits internally a sharpened edge, that runs out anteriorly as a linguiform lobe fringed with strong ciliated bristles. On the upper side of this joint, as in the Mysidæ, between the insertion of the flagella, occurs a small scale-like projection, furnished with three delicate diverging bristles. Of the flagella, the inner one is rather narrow, filiform, and of moderate length. On the other hand, the outer one is most remarkably developed, as a rule equalling the whole body in length; it is distinctly compressed throughout, indeed almost riband-shaped, and furnished with a dense fringe of sensory bristles along one of its margins.

The basal part of the antennæ (see Pls. II., III. fig. 4; Pl. IV. fig. 5; Pl. V. figs. 4 and 9; Pl. VI. figs. 3 and 9; Pl. VII. figs. 3 and 8) is, as usual, rather thick and massive, consisting of three segments, most distinctly defined below, the last of which runs out externally as a compressed projection. The terminal part nearly equals in length the inner antennular flagellum, its peduncle being rather small and divided into three articulations, of which the last is the largest. The scale exhibits a somewhat different appearance in the different species. Thus, in the three species, *Gnathophausia ingens*, *Gnathophausia gigas*, and *Gnathophausia calcarata*, it is very small and in form somewhat resembles that of *Lophogaster*, whereas in the remaining species its structure is more in accordance with that usually met with in the Caridea.

The anterior lip (Pl. IV. fig. 4, *L*; Pl. VIII. fig. 2, *L*) forms a somewhat galeate or triangular, fleshy prominence, placed posteriorly to the short epistome, at the anterior part

of the buccal area, and partly covering with its sharp posterior edge the masticatory parts of the mandibles.

The posterior lip (Pl. VIII. fig. 5) consists of two membranous and somewhat expanded lobes, connate in the greater part of their length, and exhibiting anteriorly a fringe of delicate cilia.

The mandibles (Pl. IV. fig 4, *M;* Pl. VIII. figs. 2, 3) are strongly developed, with the body evenly arched externally, and navicular in form. The cutting edge is armed with strong dentiform projections of a somewhat irregular form, and exhibits in its posterior part a distinctly fluted molar surface. As is usually the case, the armature is somewhat unequal on the right and left mandibles (Pl. VIII. fig. 2). The palp is rather large, densely setose, and consists of three joints, the first quite short, the second comparatively elongate and strongly compressed, the last rather narrow, and provided along the inner sharp edge, almost throughout its whole length, with a dense fringe of delicate spines, disposed in a pectinate arrangement, besides which it has a row of fine bristles (see fig. 3).

The first pair of maxillæ (Pl. VIII. fig. 6) exhibit, as in *Lophogaster*, two incurving masticatory lobes, of which the outer is the larger, and armed at the truncated apex with short spines, whereas the inner lobe is more membranous in structure, and densely beset with ciliated bristles. These maxillæ, however, are readily distinguished by the presence, on the outer side of the basal part, of a distinctly developed two-jointed palp, which, contrary to what is the case in other Podophthalmia, is bent directly backward, so as to project into the branchial cavity, thus acquiring at the first glance the appearance of an epignath. Both joints of this palp are beset with long and thin bristles, of which more especially those attached to the ovoid terminal joint are of very considerable length; all these bristles are armed at one of their edges with fine spinules. Regarding the function of this very peculiar palp, it certainly may be deemed similar to that observed in the corresponding part of Cumacea and the cheliferous Isopoda, viz., to cleanse the branchial cavity from foreign particles.

The second pair of maxillæ (Pl. IV. fig. 4, m^2; Pl. VIII. fig. 7) are rather large, expanded into lamellæ, and exhibit exteriorly at the base a very conspicuous mamilliform prominence (*x*), within which, in spirit specimens, is observed an opaque, finely granular matter. As stated by the late Dr. v. Willemoes-Suhm, this prominence in fresh specimens is vividly coloured, and has been regarded by that author as a kind of visual organ ("accessory eye"); hence the generic denomination *Gnathophausia*. I have, however, failed to trace any refracting elements within this prominence, and hence am inclined to regard it rather as a kind of phosphorescent organ. The basal part sends off internally, as in *Lophogaster*, two masticatory lobes, pointing obliquely forward, of which, however, the anterior is deeply cleft, almost to the base, forming two very narrow lappets, provided, in addition to the usual apical spines, with a transverse row of stiff bristles at some distance from the apex. The posterior masticatory lobe is rather

broader, linguiform, and provided along the inner margin with a double row of delicate curving bristles. The distal portion of the basal part is marked off as a distinct segment, furnished interiorly with a fascicle of bristles, whereas exteriorly, between the palp and the exognath, it runs out as an obtusely rounded prominence. The palp is comparatively more strongly developed than in *Lophogaster*, consisting, as in that genus, of two distinctly defined joints, the first of which is short and broad, the last oblong-ovate, and densely fringed with bristles arranged along the inner edge in several rows. The exognath forms a rather large ovate or elliptic lamella, attached exteriorly to the distal segment of the basal part, and fringed with a dense row of very strong and elongate ciliated bristles, all of which exhibit a distinct articulation near the base. This lamella, too, as stated above, fits comparatively closely into the lateral emargination of the carapace at the side of the buccal area (see Pl. IV. fig. 4), forming, as it were, a kind of piston, by the oscillatory movements of which the postero-anterior current of water produced beneath the free portion of the carapace may be regulated.

The maxillipeds (see Pl. IV. fig. 4; Pl. VIII. fig. 8) are rather short and thickset in form, always closely applied to the other oral parts, which are partially covered by them inferiorly. The basal part forms a rather strong transverse trunk, indistinctly divided into two segments, and giving origin, at its anterior extremity, to the incurved terminal part or palp, whereas, exteriorly, there is appended to the base a freely movable membranous plate (*ep*) projecting within the branchial cavity, representing the epipodite. This epipodite, as in *Lophogaster*, is of very considerable size, almost equalling in length the whole maxilliped, and exhibits a narrow lanceolate form, the apex being somewhat recurved. Its function, too, is more properly to produce by its rhythmical movements to and fro, the current of water flowing beneath the free portion of the carapace, and bathing the gill-branches attached outside the bases of the legs. The exopodite is present only in four of the species, viz., *Gnathophausia ingens*, *Gnathophausia gigas*, *Gnathophausia calcarata*, and *Gnathophausia gracilis*, as a very small narrow linguiform plate, fringed with ciliated bristles (see Pl. IV. fig. 4). In the remaining species it is, on the other hand, wholly wanting, and in its place may be observed a small depression invested with a thickened glabrous cuticle (Pl. VIII. fig. 8, *x*), into which the above-mentioned mamillar prominence of the second pair of maxillæ would appear to fit (see Pl. VIII. fig. 17). The terminal part, or palp, scarcely exceeds in length the basal, and is densely beset with bristles on both margins. It consists of five distinctly defined joints, the third of which (carpus) is rather large and laminarly expanded. The terminal joint (dactylus) is lanceolate, and at the inner edge finely dentate. Of distinctly developed masticatory lobes no trace can be found.

The first pair of legs (Pl. VIII. fig. 9) differ but very slightly in appearance from the remaining ones, and cannot therefore be strictly regarded as true gnathopoda. The basal section, contrary to what is the case in the maxillipeds, is exceedingly short, whereas the

terminal part forms a very elongate five-jointed stem. Of the joints the carpal, as in the maxillipeds, is by far the largest, being even longer than the whole of the preceding part of the leg. It is greatly compressed and somewhat expanded toward the end, being fringed moreover at the distal part of the exterior edge with a row of very long, anteriorly curving, ciliated bristles. The inner edge of this joint, too, is likewise provided with several slender bristles, as also with a dense series of delicate curved spinules, crowded together at the distal part. The succeeding joint (propodus), which, as a rule, along with the carpal joint forms a strong geniculate curve, is likewise rather elongate, but considerably narrower, somewhat curved, and densely setigerous, more especially at the inner edge. The terminal joint or dactylus is narrow, lanceolate, and armed at the inner edge with a dense row of small spinules, as also with a few elongated bristles. The exopod, as in the succeeding legs, is developed into a powerful natatory branch, on which can be distinguished a somewhat thickened and strongly muscular basal part, together with a narrow and very flexible multiarticulate terminal part, furnished on both edges with strong natatory setæ. At the base of this leg is attached a fully developed gill of precisely the same structure as that characterising the five succeeding pairs of legs. Projecting from the outer side of the basal part, may also be observed a very small linguiform lobe, fringed with several exceedingly long and slender diverging bristles. This lobe, which also occurs on the remaining legs (see fig. 10, *ep*), would seem to represent a kind of rudimentary epipod.

The succeeding legs (see Pl. VIII. figs. 10, 16) are all comparatively uniform in structure, and very similar in appearance to the first pair, described above, differing only in the carpal joint being somewhat less expanded and without the long ciliated bristles at the outer edge, and also in the propodal joint being straighter and having the bristles arranged in more or less distinct fascicles. This arrangement of the bristles induced the late Dr. v. Willemoes-Suhm to describe the terminal portion of the legs as subdivided into short articulations, as in the Mysidæ, a character which, however, has not been proved in reality to exist.

The legs, having all the character of true pereiopoda, as a rule diminish somewhat in size posteriorly, likewise assuming, successively, a more slender form (see fig. 16). On the last pair (fig. 14) the carpal and propodal joints become very narrow and of nearly uniform length, both being furnished with numerous distinctly defined fascicles of bristles. The terminal claw moreover is rather small and of a conical form.

The gills (see Pl. VIII. figs. 16, 17) exhibit a rather complex structure, and occur at the bases of all the legs. At the last pair, however (see fig. 14, *br*), they are very small and rudimentary, merely consisting of a single branch placed at the outer side. On the other hand, all the remaining gills (six pairs in number) are of a perfectly uniform structure, consisting of no less than four principal branches (see figs. 9, 11) springing from a common base. Of these branches the largest, as in *Lophogaster*, is

bent towards the ventral face, where it is freely suspended, meeting the corresponding branch on the opposite side in the median line (see fig. 16), whereas the remaining three branches occur on the exterior side of the legs and are completely covered by the marginal portion of the carapace. Every gill-branch, too, consists of a median stem, sending off in comparatively regular sequence secondary branches from each side, whereby the whole branch acquires a bipinnate appearance. The secondary branches or pinnulæ are, furthermore, divided into a vast number of small lobes (see fig. 13) arranged with less regularity, and even these lobes may occasionally be found,—especially on the inner part of the gill-branch,—to be subdivided into smaller lobules. The final ramifications of the gills are always of a simple cylindrical, or rather vesicular, form, never, as in *Lophogaster*, foliaceous. Regarding the insertion of the gills, they would seem to originate at the articulation between the bases of the legs and the pleuron of the corresponding segment, and hence may properly be designated "arthrobranchiæ," although, on dissection, they remain as a general rule in connexion with the legs.

In the fully developed females, as with *Lophogaster*, seven pairs of large foliaceous lamellæ, fringed at the edges with bristles, spring from the bases of all the legs, and, folding one over the other in the median line, form a capacious marsupial pouch, projecting from beneath the trunk (see Pl. II. fig. 1; Pl. V. fig. 1; Pl. VI. fig. 6).

In the males, on the other hand, may be observed, at the base of the last pair of legs posteriorly (see Pl. VIII. fig. 14, *p*, and fig. 15) and on each side, a small tuberculiform prominence, representing the outer sexual appendage, and having at its extremity the fissure-like opening for the efferent duct of the testes.

The caudal limbs (Pl. VIII. fig. 18) in both sexes are developed in the same manner as powerful natatory organs, consisting of a somewhat applanated and strongly muscular basal part, and two very elongate and slender terminal branches, the outer part of which is subdivided into a great number of small articulations furnished with strong natatory setæ. They all exhibit a perfectly uniform structure, none of them in the males being distinguished by the slightest peculiarity, as is the case in the Euphausiidæ and Mysidæ.

The telson (see Pl. II. fig. 7; Pl. III. fig. 6; Pl. IV. fig. 7, &c.) is exceedingly large, and has the upper face somewhat channelled along the middle, exhibiting on each side an obtuse longitudinal keel. It is slightly constricted near the base, and tapers more or less rapidly toward the apex, which juts out into two strongly curved spines, connected in the middle by a serrate lamella, thus forming together an almost semilunar projection. The lateral edges of the telson are densely spinulous throughout their distal portion, the spinules being of somewhat unequal size, so that between two larger ones, as a rule, occur a more or less considerable number of much smaller ones. At the base of the telson, on the ventral face, is placed as usual the fissure-like anal opening.

The uropoda (*ibid.*) are generally shorter than the telson, and consist of an exceedingly short basal part and two terminal plates, which admit of being spread out on

either side, so as to form, along with the telson, a complete caudal fan. The outer plate is the larger of the two, and has the outer edge rather arched in the middle, and terminating posteriorly in a short dentiform projection, invariably placed at some distance from the apex. From this projection, too, a distinctly marked transverse suture passes obliquely across the plate, marking off the linguiform terminal portion of the plate as a distinct joint, which, to a certain extent, would even appear to be movable by the help of two thin muscles, proceeding to it from the proximal segment of the plate. The whole of the interior border of this plate, as also the terminal lobe, is fringed with a dense row of ciliated bristles. The inner plate is generally both somewhat shorter and much narrower than the outer, and lanceolate in form, being also fringed around all its borders with a row of similar bristles.

Nervous System.—The ventral chain of ganglia (see Pl. VIII. fig. 19) is more especially distinguished by the very inconsiderable degree of centralisation observed in the portion belonging to the anterior division of the body, exhibiting thereby a striking resemblance to that in some lower forms of Crustacea, for example in Isopoda and Amphipoda. The several ganglia are, on the whole, of a very uniform appearance, and connected by rather long double commissures, their original twofold nature being also distinctly perceptible. Exclusive of the cephalic or supra-œsophageal ganglion, nine ganglia are found to belong to the anterior division of the body, and six to the posterior, making in all fifteen different ganglia. Of these, only the two foremost (1–2), providing the buccal parts with nerves, are partly coalescent, while all the rest are distinctly definable. The commissures connecting the second and third ganglia are certainly very short, leaving between them only a small rounded opening; but the rest are of considerable length and of distinctly fibrous structure. On the upper side of each of the ganglia, counting from the fourth to the eighth, is observed a ligature-like, transverse commissure (see fig. 20), arching over and holding in position the great ventral artery (*a*) which, passing forward, sends off on each side immediately behind the ganglia a lateral branch for the corresponding leg and its several appendages.

The ganglia of the tail (see fig. 19) are somewhat inferior in size to those of the trunk, and are connected by much longer commissures, which, moreover, are placed close together. The last caudal ganglion (6), occurring at the base of the caudal fan, is somewhat larger than those preceding it, and sends off numerous nerves, some entering the telson, some the uropoda, and finally innervates the muscles surrounding the anal opening.

Colour.—As has been stated by the late Dr. v. Willemoes-Suhm, all the specimens examined by him belonging to this genus were, while still alive or in a fresh state, of a vivid red colour, and in reality it is probable that this characteristic is common to all the species, a similar colour being likewise observed in several other deep-sea Crustacea.

Habitat.—All the species belonging to the present genus seem to be well marked deep-sea forms. The least depth from which specimens have been obtained is

255 fathoms (*Gnathophausia longispina*), the greatest 2200 fathoms (*Gnathophausia gigas*). *Gnathophausia* has never been taken at the surface of the sea, although the surface-net was in frequent use during the Expedition, both by night and day, and in many different tracts of the ocean. It may therefore certainly be assumed that these Crustacea, notwithstanding their strongly developed natatory organs, never leave the deeper strata of the sea, and that in all probability they have their habitat on the sea-bottom itself.

To judge from the inconsiderable number of examples of each species obtained by the Expedition, notwithstanding that a large trawl-net was generally in use, it would appear that the animals of this genus lead a comparatively isolated existence, being seldom met with in shoals.

Distribution.—The genus seems to exhibit a very extensive geographical distribution, being most probably represented throughout the greater part of the ocean, excepting perhaps the Arctic and Antarctic regions. Thus, as will be shown in the sequel, species of this genus have been recorded both from the North and South Atlantic, from the Pacific, and from the seas of the Indian Archipelago. The genus may even be reckoned among the European fauna, one of its species (*Gnathophausia zoëa*) having been found by the French expedition in the Bay of Biscay.

Classification.—The species may be naturally classed within two or rather three sections or subgenera, chiefly characterised by the form of the antennal scale, the presence or absence of an exopodite on the maxillipeds, and finally by the form of the carapace.

The following synopsis of the species may be here appended:—

Synopsis of the Species of Gnathophausia.

Antennal scale	very small, not jointed, outer margin serrate. Rostrum	short, indistinctly denticulate,				*G. ingens*, Dohrn.
		elongate. Infero-posterior corners of carapace	slightly produced,			*G. gigas*, Suhm.
			produced as long serrate spines,			*G. calcarata*, G. O. Sars.
	large, of usual form, jointed, outer margin terminating in a strong spine. Inferoposterior corners of carapace	rounded off. Dorsal spine	comparatively short. Upper lateral keel	distinct. Epimera of the caudal segments	sharply pointed,	*G. willemoesii*, G. O. Sars.
					obtuse.	*G. affinis*, G. O. Sars.
				obsolete.		*G. elegans*, G. O. Sars.
			greatly produced. Antennal scale with spine of the outer corner	of moderate size,		*G. zoëa*, Suhm.
				greatly produced and serrate on both margins,		*G. longispina*, G. O. Sars.
		produced into two distinct spines.				*G. gracilis*, Suhm.

Section 1.—Infero-posterior corners of carapace produced into sharp points more or less elongated. Dorsal spine short or obsolete. Dorsal keel of carapace interrupted in the middle part. Supra-orbital spines small or obsolete. Antennal scale small, not jointed, outer margin serrate. Maxillipeds with a small exopodite. Epimeral spines of the last caudal segment confluent on the ventral face, forming together a cordiform concave plate, incised at the apex.

3. *Gnathophausia ingens* (Dohrn) (Pl. II.).

Lophogaster ingens, Dohrn, Untersuchungen über Bau und Entwickelung der Arthropoden, Zeitschr. f. wiss. Zool., Bd. xx. p. 610, pl. xxxi. figs. 12–14. 1870.
Gnathophausia inflata, Suhm, MS.
Gnathophausia ingens, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 3.

Specific Characters.—Form of body rather robust, the anterior division (in the female) greatly inflated. Carapace large, with the infero-posterior corners produced into small slightly curved spines. Dorsal spine very short, almost obsolete. Rostrum short, very broad at the base, indistinctly denticulate. Supra-orbital spines wanting; antennal spines small but distinct; branchiostegal spines obsolete. Eyes with rather long and narrow pedicles, cornea somewhat expanded. Antennal scale very small, subovate, apex truncate, outer edge minutely serrate in the distal half. Caudal segments distinctly sculptured, both lappets of the epimera pointed. Epimeral plate of last segment large and deeply cleft at apex. Telson much longer than uropods; its lateral edges evenly arched. Length, 157 mm.

Remarks.—The present gigantic Schizopod had already been described and figured by Professor A. Dohrn in the year 1870 from a somewhat defective specimen sent him from the Zoological Museum of Hamburg. Notwithstanding that all the legs in his specimen had been broken, Professor Dohrn was yet able to recognise it as a true Schizopod, most nearly approximating to *Lophogaster*; and he described it as a new species of the genus under the name of *Lophogaster ingens*. The examination of the specimen procured by the Challenger Expedition, which is comparatively well preserved, fully confirms this view, so far as regards the Schizopod nature of this form and its relationship to *Lophogaster*. On the other hand, it cannot at present be strictly referred to the last mentioned genus, but is to be regarded as a true *Gnathophausia*. This view was also suggested by the late Dr. v. Willemoes-Suhm, who, in his manuscript notes, has mentioned this form under the name of *Gnathophausia inflata*, n. sp. The specific denomination "*ingens*" proposed by Dohrn having, however, been given prior to the Challenger Expedition, must of course be retained for the species.

Description.—The specimen obtained by the Challenger Expedition is a full-grown

female, with enormously developed marsupial pouch, from which apparently the young had just emerged.

The length of the body, measured from the tip of the rostrum to the extremity of the telson, is 157 mm., a truly gigantic size for a Schizopod; and this form ranks therefore as the largest by far of all hitherto known Schizopods. The specimen examined by Professor Dohrn was likewise very large, measuring 155 mm. in length.

The general form of the body (see figs. 1 and 2) is comparatively rather clumsy and thickset, the anterior division being very massive and greatly inflated, and fully attaining the length of the tail.

The integuments are throughout rather soft and flexible, exhibiting, as it were, a parchment-like consistence.

The carapace is of very considerable size, completely covering the whole of the anterior division of the body, and even somewhat overlapping at the sides the first caudal segment. It is, too, evenly arched above and rather broader than high. The two lateral keels are somewhat prominent; on the other hand, the dorsal carina is wholly effaced in the middle of the carapace, being distinct on the rostral part only, and far behind, where it terminates in a very short pointed projection, or a rudiment of the dorsal spine. Between the anterior part of the two upper lateral keels is seen the linguiform dorsal area (see fig. 2), which only reaches to about the middle of the length of the carapace. The rostrum is comparatively short, but very broad and massive at the base, and forms a horizontal, triangular projection, protruding from the anterior part of the carapace, and partly covering the antennular peduncles and the inner part of the ocular pedicles. It terminates in a sharp point, and exhibits but very faint traces of the usual denticles, which in other species are to be found both on the dorsal and the lateral keels. Of supra-orbital spines, no trace whatever can be detected. On the other hand, the antero-lateral corners of the carapace jut out as distinct, though rather small, antennal spines; and slightly posterior to each spine may be observed a small projection, representing a rudiment of the branchiostegal spine. Posteriorly, the carapace forms in the middle a rather deep emargination, embracing here, as it were, the first caudal segment. The infero-posterior corners (see fig. 1) are produced as very short spines, curving somewhat upward, and the posterior margin of the carapace forms on either side immediately above this spine an evenly arched curve. Moreover, at some distance from the edge may be observed two parallel elevated lines, connecting the two lateral keels, and these are also continued above to the dorsal carina.

The tail, as in the other species of the genus, is very slender and almost cylindrical in form, though somewhat flattened above. It exhibits a very conspicuous sculpture, consisting of numerous irregularly flexuous impressions, limited by elevated lines, giving to that part a peculiarly wrinkled appearance. Its segments are nearly of uniform length, but diminish somewhat both in height and breadth posteriorly. The epimera

are distinctly developed and almost perpendicular, projecting into two acutely pointed lappets, of which the posterior is the larger and is provided with an elevated keel.

The last segment, as in the other species, is divided by an obliquely transverse suture into two sections, the anterior of which juts out on either side into an epimeral projection, which unites on the ventral face with the corresponding one on the opposite side, forming together a large cordiform plate, concave in the middle and cleft at the apex into two slender, bidentate lappets, reaching even somewhat beyond the extremity of the segment (see fig. 6).

The eyes (fig. 3) are more especially distinguished by the considerable length of the pedicles, which are very narrow, and apparently consist of two segments, the external one exhibiting above a small papillary projection. The cornea is rather expanded and somewhat oblique, occupying, however, but a comparatively small part of the eye itself.

The antennular peduncle (see figs. 1 and 2) is very short and thick, scarcely reaching beyond the eyes when they are extended. The flagella, too, were partly defective in the specimen examined.

The antennal scale (see fig. 4) is comparatively very small and of an oval form, the extremity being truncated or very slightly emarginate, with the inner corner a little more prominent than the outer. The outer edge is somewhat arched, and, in its distal half, armed with about six very small and inconspicuous teeth. The inner edge, too, is almost straight, being rather strongly arched in its hindmost part: it is fringed throughout with a dense row of comparatively short bristles.

The oral parts, so far at least as they admit of being examined without dissection, would seem on the whole to agree perfectly with those in the two succeeding species. As in the latter, the maxillipeds are provided with a distinct though very small lamelliform exopodite.

The legs (fig. 5) are comparatively rather robust in structure and densely setigerous on both margins, the carpal and propodal joints being strongly compressed and the dactylus rather small.

The incubatory lamellæ, composing the marsupial pouch, are, in the specimen treated of here, exceedingly large, of an oblong-ovate form, and densely setose at the edges, forming together a very conspicuous, convex prominence beneath the trunk (see fig. 1).

The telson (see fig. 7) is very large and massive, equalling in length the three preceding segments taken together. The outer part tapers successively toward the apex, and has the lateral edges but slightly arched and armed with a vast number of fine spinules. The two falciform apical spines are, as usual, confluent at the base, forming together a semilunar projection appended to the apex of the telson, with its posterior concave margin finely serrate.

The uropoda (*ibid.*) are much shorter than the telson, but otherwise exhibit the structure characteristic of the genus.

Habitat.—The above described specimen was obtained by the Challenger Expedition, in the vicinity of the Arrou Islands, in the Arafura Sea, lying between New Guinea and Australia.

Station 191, September 23, 1874; lat. 5° 41′ S., long. 134° 4′ 30″ E.; depth, 800 fathoms; green mud; bottom temperature, 39°·5.

The specimen examined by Professor Dohrn, according to the label on the bottle containing it, was procured off the coast of Africa ("Laos"); depth not recorded.

4. *Gnathophausia gigas*, Willemoes-Suhm (Pl. III.).

Gnathophausia gigas, Suhm, Trans. Linn. Soc. Lond. (Zool.), ser. 2, vol. i. p. 28, pl. ix. figs. 16, 17; pl. x. figs. 2, 3, 1875.

Gnathophausia gigas, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 4.

Specific Characters.—Form of body (in male) rather more slender than in the last species. Carapace less tumid, having the infero-posterior corners more produced and jutting out into short mucroniform spines, reaching to the end of the second caudal segment. Dorsal spine almost obsolete. Rostrum rather produced and slender, distinctly denticulate. Supra-orbital, antennal, and branchiostegal spines all distinct but small. Caudal segments less distinctly sculptured, the anterior lappet of the epimera small and rounded. Epimeral plate of last segment less produced. Eyes narrow, with cornea very small. Antennal scale much larger than in *Gnathophausia ingens*, and somewhat tapering toward the apex, outer edge divided into four strong teeth, inner corner produced into a rather prominent sharp point. Telson very large, with the lateral margins bulging out in the middle and densely spinulose, terminal spines widely diverging. Length, 142 mm.

Remarks.—The present species has already been briefly described and figured by the late Dr. v. Willemoes-Suhm in the above quoted treatise, and designated by the specific name of "*gigas*," the preceding still larger form not being known to him at that date. From this latter species it differs, among other characteristics, by the comparatively more slender form of the body, the much more produced rostrum, the larger and differently formed antennal scale, and the less completely developed eyes. Moreover, the spines, issuing from the infero-posterior corners of the carapace, are somewhat different in shape, and the sculpturing of the tail is by no means equally conspicuous.

Description.—Of this species, also, only a solitary specimen in an excellent state of preservation was obtained, viz., a full-grown male, measuring in length 142 mm. As the males of this genus differ but very slightly from the females, it may not unreasonably be inferred that the characters adduced above as specific marks would, on the whole, be no less applicable to the females of this species.

The form of the body (see figs. 1, 2) is rather more slender than in *Gnathophausia ingens*, but in this respect, probably some regard should be paid to the circumstance

that the specimen under treatment is a male, while that representing the preceding species is a female.

The integuments are throughout very thin, and in the spirit specimen semi-diaphanous, so as to admit of the muscular system being distinctly traceable through the skin.

Here, too, the carapace covers the whole of the anterior division of the body, but is far from being so inflated as in *Gnathophausia ingens*, its breadth scarcely exceeding its height. The lateral wings are comparatively more produced, and terminate in a perfectly straight, mucroniform spine, reaching as far as the end of the second caudal segment. The keels of the carapace, as also the dorsal area, exhibit precisely the same appearance as in the preceding species. On the other hand, the rostrum would seem to have been much more produced, though I cannot myself state its length with exactness, the point having been broken off in the specimen. To judge, however, from the form of its basal part still remaining, it may certainly be inferred to have been at least much more elongate than in *Gnathophausia ingens*, and in the figures given by the late Dr. v. Willemoes-Suhm, which were drawn from the recently taken and uninjured specimen, it is in reality represented as being more than half as long as the carapace, and also distinctly denticulate throughout.[1] There is, contrary to what is the case in the preceding species, a distinct, though rather small, supra-orbital spine on either side of the base of the rostrum. Moreover, both the antennal and the branchiostegal spines are distinctly marked.

The caudal segments do not exhibit the peculiar wrinkled sculpture distinguishing this part in *Gnathophausia ingens*, only a slight transverse impression being observable at each extremity. On the epimera, too, the anterior lappet is very short, and rounded at the apex, not pointed as in that species. Here, also, the epimeral projections of the last segment are confluent on the ventral face, forming together a cordiform concave plate (see fig. 5), but this is much shorter than in *Gnathophausia ingens*, and its apical indentation broader.

The eyes (fig. 3), as in *Gnathophausia ingens*, are very narrow, but the cornea is much smaller and scarcely expanded at all; moreover, the ocular papilla is situated closer to the base of the pedicle.

The antennular peduncle (see figs. 1, 2) is greatly thickened, with the second joint exceedingly short, and almost discoid. The outer flagellum is indeed enormously developed, even exceeding in length the whole body, being also very strong and distinctly riband-shaped. The inner flagellum is much more slender, and about the same length as the carapace, exclusive of the rostrum.

The antennal scale (fig. 4) considerably exceeds in size that of the preceding species, and also exhibits a rather different form, tapering somewhat toward the apex, the inner

[1] In Pl. III. figs. 1 and 2 given in the present Report, the missing part of the rostrum has been added after the drawings of Dr. v. Willemoes-Suhm.

corner of which is drawn out to a very prominent and sharply pointed projection. The outer edge is, moreover, divided into four strong teeth, somewhat increasing in size toward the apex; and between the last of these and the inner corner, the edge of the scale is evenly emarginate. The flagellum about equals in length the inner antennular flagellum.

The oral appendages and the legs do not seem to exhibit any essential difference from the same limbs in *Gnathophausia ingens*.

On the other hand, the caudal limbs appear to be somewhat more strongly developed, but this may arise from the circumstance that the specimen treated of is a full-grown male.

The telson (see fig. 6) is of very considerable size, even surpassing in length the three preceding segments taken together. In form it agrees very closely with that of the preceding species, differing only in the lateral edges being somewhat more abruptly arcuate in the middle, and in the marginal spinules being comparatively coarser. The apical spines (see fig. 7) are widely divergent, and are furnished near the point on the outer side with a small tooth; the evenly concave margin connecting both spines is finely and regularly serrate.

The uropoda (*ibid.*) seem to be a little more elongate than in *Gnathophausia ingens*, but in other respects exhibit a very similar appearance.

Habitat.—The specimen described above was taken in the North Atlantic, west of the Azores, at a very considerable depth.

Station 69, June 25, 1873; lat. 38° 23′ N., long. 37° 21′ W.; depth, 2200 fathoms: Globigerina ooze; bottom temperature, 36°·2.

Exclusive of this specimen, I also found among the material placed in my hands for examination the recently moulted skin of the outer part of the tail of another specimen, apparently belonging to the same species. This skin was brought up along with specimens of *Boreomysis scyphops*, in the Southern Ocean, between Kerguelen and Australia.

Station 157, March 3, 1874; lat. 53° 55′ S., long. 108° 35′ E.; depth, 1950 fathoms; Diatom ooze; bottom temperature, 32°·1.

Hence the species seems to exhibit a rather extensive geographical distribution, its occurrence in both hemispheres having been ascertained.

5. *Gnathophausia calcarata*, G. O. Sars (Pl. IV.).

Gnathophausia gigas, var., Suhm MS.
Gnathophausia calcarata, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 5.

Specific Characters.—Integuments rather firm. Carapace with a well marked, although somewhat short, dorsal spine, projecting from the middle of the posterior margin, the infero-posterior corners produced into very long and slender, finely serrate

spines. Rostrum strong, of about the same length as the carapace, distinctly denticulate. Supra-orbital spines obsolete, antennal and branchiostegal spines well defined, the latter remarkably strong and finely serrate, pointing outward. Caudal segments sculptured with transverse impressions, epimera produced into two acuminate lappets of nearly equal size. Eyes pyriform, cornea rather expanded. Antennal scale very small, ovate, outer margin slightly serrate, apex obliquely truncate, inner margin arcuate. Telson large, with the terminal spines crescent-shaped and denticulate along the upper face. Uropoda much shorter than telson. Length of largest specimen (which had probably reached its maximum size) 98 mm.

Remarks.—This form has been preliminarily recorded by the late Dr. v. Willemoes-Suhm, in his manuscript notes, as a variety of *Gnathophausia gigas*. It should, however, be certainly regarded as a distinct species, though closely related to the two preceding ones. From *Gnathophausia gigas* it may, among other characteristics, be readily distinguished by the unusually firm integuments, the distinctly marked dorsal spine, and the remarkably long spines issuing from the infero-posterior corners of the carapace, a character which has given rise to the specific denomination "*calcarata*." Futhermore, the rostrum is much coarser in structure, and the branchiostegal spines considerably more developed; while, as a final distinction, the eyes and the antennal scale are of a somewhat different form.

Description.—Of this handsome species there are two well preserved specimens in the collection, both males. The largest specimen has a length of 98 mm.; the other is rather smaller in size, the length being only 68 mm. These two specimens exhibit, it would seem, some difference as regards the length of the rostrum and the lateral spines of the carapace, but in all other respects agree perfectly with each other.

The general form of the body (see figs. 1, 2) closely approximates to that of *Gnathophausia gigas*, though perhaps a trifle more robust.

The integuments are throughout very much firmer than in either of the two preceding species, and apparently they are somewhat indurated, giving to all the parts of the body a more solid and distinctly defined appearance.

The carapace, although rather large, does not cover the trunk to the same extent as in the two preceding species, the last segment being partly exposed behind the posterior margin. Both the lateral keels are strongly prominent, whereas the dorsal keel, as in the former species, is distinct in the anterior and posterior parts only, being quite obsolete in the middle of the carapace. The dorsal spine, projecting from the middle of the posterior margin, is well marked, though not attaining any considerable length. On the other hand, the spines projecting from the infero-posterior corners of the carapace are remarkably elongate and slender, mucroniform, and somewhat diverging, being finely serrate at the edges. In the smaller specimen (see fig. 3) these spines are much produced, reaching even to the end of the third caudal segment; in the larger one (figs. 1, 2) they

are somewhat shorter, but, in other respects, of very similar appearance. As in *Gnathophausia ingens*, two distinctly elevated lines may be observed a short distance within the posterior margin of the carapace, running parallel to the edge. The rostrum is strongly developed, and rather produced, in the smaller specimen (fig. 3) being about as long as the carapace, in the larger (figs. 1, 2) somewhat shorter. It extends, as usual, horizontally, and is three-edged and distinctly denticulate throughout, terminating in a sharp point. The supra-orbital spines would seem to be wanting, or at least are very inconspicuous, the slight projections seen at the base of the rostrum (fig. 3, *a*) being simply a pair of the lateral rostral denticles placed at some distance posterior to the others. On the other hand, the antennal spines (*b*) are very distinctly marked, and the branchiostegal spines (*c*) distinguished by very considerable size, jutting out on either side as a pair of strong, denticulated processes.

All the caudal segments exhibit, at some distance from the posterior margin, a rather deep transverse impression, and, in addition to this characteristic, are very sharply defined, the one from the other. As in *Gnathophausia ingens*, both lappets of the epimera are acutely pointed and somewhat produced, the anterior being a trifle smaller than the posterior. The epimeral spines of the last segment (see fig. 6) in this species are also partly connected on the ventral face, and are rather smaller than in the two preceding species, the terminal indentation between their outer parts being also shorter and broader.

The eyes (see figs. 1, 2, 4) are slightly dilated toward the apex, almost clavate in form, the cornea being more expanded than in the preceding species.

The outer flagellum of the antennulæ (see figs. 1, 2) is remarkably strong, and about equal in length to the whole body, the rostrum excepted.

The antennal scale (see figs. 4, *a*, 5) is comparatively very small, and ovate in form, somewhat resembling that of *Gnathophausia ingens*. Its apex, however, is here obliquely truncate, not emarginate, and the inner corner is rather more prominent than in that species. The outer edge exhibits in its distal part five or six somewhat unequal and rather small teeth, and the inner setigerous edge is more evenly curved than in *Gnathophausia ingens*.

The oral parts (see fig. 4), the legs, and the caudal limbs would seem on the whole to agree perfectly with the same parts in the two preceding species, save, perhaps, that the legs are somewhat more robust in form and less elongate.

The telson (see fig. 7), as in the two preceding species, is very large and massive, about equalling in length the three preceding segments taken together, and it gradually tapers toward the apex, the lateral edges being evenly arched, and armed with a large number of small spinules. The two apical spines, connected as usual in the middle, form a comparatively regular crescent-shaped projection, finely serrate at the bottom of the posterior emargination, and, moreover, exhibiting on the upper face a row of small denticles.

The uropoda (*ibid.*) are much shorter than the telson, and have a somewhat similar form to those in *Gnathophausia ingens*.

Habitat.—Of the two specimens obtained by the Challenger Expedition, the larger was taken, along with the above described specimen of *Gnathophausia ingens*, in the Arafura Sea.

Station 191, September 23, 1874; lat. 5° 41′ S., long. 134° 4′ 30″ E.; depth, 800 fathoms; green mud; bottom temperature, 39°·5.

The other specimen was obtained in the vicinity of the Talaur Islands, south of Mindanao (Philippines).

Station 214, February 10, 1875; lat. 4° 33′ N., long. 127° 6′ E.; depth, 500 fathoms; blue mud; bottom temperature, 41°·8.

Hence the geographical distribution of this species, so far as is at present known, ranges within the seas of the East Indian Archipelago.

Section 2.—Infero-posterior corners of carapace rounded off. Dorsal spine produced. Dorsal keel uninterrupted in the middle. Supra-orbital spines distinctly defined from the rostral part of carapace, and rather large. Antennal scale of the form usually met with in the Caridea, jointed at the extremity, outer edge jutting out anteriorly as a more or less produced spine. Maxillipeds without any trace of exopodites. Epimeral spines of last caudal segment not confluent on the ventral face.

6. *Gnathophausia willemoesii*, G. O. Sars (Pl. V. figs. 1–6).

Gnathophausia zoëa, var., Suhm MS.
Gnathophausia willemoesii, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 6.

Specific Characters.—Form of body rather robust. Carapace covering whole of trunk, with the dorsal spine comparatively short, projecting only a little beyond the first caudal segment. Rostrum shorter than carapace, very narrow, and provided with small denticles comparatively few in number. Supra-orbital spines very strong, anteriorly curved; antennal spines distinct; branchiostegal spines obsolete. Five anterior caudal segments keeled above, and produced posteriorly into short but distinct dorsal processes; posterior lappet of epimera lanceolate. Eyes pyriform. Antennal scale rather large, only twice as long as broad, terminal lobe but slightly projecting beyond the spine of the outer corner. Telson linguiform, lateral margins evenly curved and densely spinulous; apical spines rather short, serrate at the posterior margin. Uropoda somewhat shorter than telson. Length 136 mm.

Remarks.—In his manuscript notes the late Dr. v. Willemoes-Suhm has recorded,

with a certain amount of hesitation, this form as a variety of *Gnathophausia zoëa*. In my opinion, however, it should decidedly be regarded as a distinct species, although belonging to the same section of the genus as that species. From *Gnathophausia zoëa* (see Pl. VI. figs. 6, 7) it may at a glance be distinguished by the far inferior development of both the dorsal spine and the rostrum, by the different form of the antennal scale, and finally by its much greater size.

Description.—There are two specimens of this species in the collection; one of very considerable size, reaching a length of 136 mm. This is a female, with distinctly developed incubatory lamellæ. The other specimen is somewhat smaller, and would seem to be a male, as no trace of incubatory lamellæ can be discerned, but in other respects it agrees perfectly with the first named specimen.

The form of the body (see figs. 1, 2), as compared with that of the other species belonging to this section, is rather robust, the anterior division being unusually massive and thickset.

The integuments are not very firm, though somewhat more so than in *Gnathophausia ingens* and *Gnathophausia gigas*.

The carapace is rather large, covering the whole of the trunk, none of the segments of the latter being exposed. It is evenly arched above, and about as broad as high. Both the lateral keels are distinctly marked, though by no means so prominent as in *Gnathophausia calcarata*. The dorsal keel in this species does not experience any interruption whatever, being continued along the whole back of the carapace, and running out posteriorly as a strong mucroniform projection—the dorsal spine. This spine, too, is decidedly glabrous, and does not attain any considerable length, projecting but slightly beyond the first caudal segment. As in the other species belonging to this section, the infero-posterior corners of the carapace are evenly rounded off, without any trace of the spine occurring here in the three preceding species. Moreover, the lower lateral keel, which in these species runs out into the said spine, in this animal curves upward before reaching the margin, and joins the upper one at the base of the dorsal spine. Close to the posterior margin another elevated line may be seen, which, in connexion with the above mentioned continuation of the lateral keel, marks off a slight groove, running parallel to the posterior edge of the carapace. The rostrum is exceedingly slender, and does not seem to attain the length of the carapace. The point in both specimens, however, having been broken off, its length cannot be stated with perfect accuracy. It is very slightly curved, and exhibits in its distal part a few small denticles, arranged dorsally as well as laterally, the proximal part being wholly unarmed. The supra-orbital spines are distinctly marked off from the rostrum, jutting out as two very strong, anteriorly curving, and acutely pointed, projections, to either side from the frontal part of the carapace, partly covering the bases of the eyes above. The antennal spines, too, are rather well defined and somewhat diverging. On the other hand, the branchiostegal spines are quite absent,

their place being occupied by the rounded lateral expansions of the carapace to the sides of the buccal area.

Of the caudal segments, the five anterior ones are distinctly keeled along the middle of the dorsal face, and jut out at the posterior margin into short posteriorly pointing spines. The epimera are rather small, and the anterior lappet is almost obsolete, whereas the posterior is somewhat produced and acutely pointed. The epimeral spines on the last segment are comparatively small, and do not, as in the preceding species, unite on the ventral face, being on the contrary, separated by a distinct interstice (see fig. 5).

The eyes (fig. 3) are rather short and pyriform, the cornea being greatly expanded, and occupying a considerable part of the eye. The ocular papilla is very small, and placed about the middle of the pedicle.

The antennulæ (see figs. 1, 2) exhibit the usual structure, the peduncle being short and thick, and the outer flagellum strongly developed, almost equalling in length the whole body.

The antennal scale (fig. 4), on the other hand, does not show any resemblance to that in the three preceding species, being more in accordance with the structure usually met with in the Caridea. It is rather large and oblong-ovate in form, about twice as long as broad, with the inner edge very considerably arched in its proximal part, the outer almost straight, and running out into a strong, anteriorly pointing, spine. The terminal part of the scale forms a linguiform lobe, projecting a little beyond the said spine, and fringed throughout with a dense row of ciliated bristles, which is also continued along the whole internal margin of the scale. From the base of the above mentioned spine, a distinctly marked suture passes, in an obliquely transverse direction, across the scale, dividing it into two segments, which to a certain extent will admit of being moved towards each other, a fascicle of short muscles joining the suture posteriorly.

The oral parts do not seem to exhibit any essential difference from those in the preceding species, except that, as in all the species belonging to this section, the maxillipeds are found wholly destitute of the exopodites.

Moreover, the legs and caudal limbs are of a very similar structure.

The telson (fig. 6) is rather large, though perhaps less massive than in the three preceding species, and exhibits a comparatively regular linguiform shape, the lateral margins being evenly arched in their distal part, and armed with numerous delicate spinules arranged in the usual manner. The apical spines are rather small, forming together, as in the other species, a crescent-like projection, finely serrate along the evenly concave posterior margin.

The uropoda (see figs. 1, 2), as in the other species belonging to this section, are rather larger than in the three preceding ones, reaching almost to the tip of the telson, when extended posteriorly; their structure, however, is very similar to that in the above mentioned species.

Habitat.—The two specimens of this species procured by the Challenger Expedition were taken in the same locality, south of Amboina, in the Banda Sea.

Station 195, October 3, 1874; lat. 4° 21′ S., long. 129° 7′ E.; depth, 1425 fathoms; blue mud; bottom temperature, 38°0.

7. *Gnathophausia affinis*, G. O. Sars (Pl. V. figs. 7–10).

Gnathophausia affinis, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 7.

Specific Characters.—Form of body more slender than in the last species. Carapace comparatively small, not covering completely the last segment of the trunk. Dorsal spine rather short, not projecting beyond the first caudal segment. Rostrum shorter than carapace, exhibiting a very close and delicate armature of small denticles, continued above to its very base. Supra-orbital spines not very strong, and somewhat diverging; antennal and branchiostegal spines inconspicuous. Caudal segments not keeled above, nor provided with dorsal processes; posterior lappet of epimera rounded at the tip. Antennal scale narrower than in *Gnathophausia willemoesii*, its terminal lobe greatly surpassing the spine of the outer corner. Telson and uropoda nearly the same as in *Gnathophausia willemoesii*. Length, 81 mm.

Remarks.—This species is very closely allied to *Gnathophausia willemoesii*, but apparently distinct, differing, among other characteristics, in the form and armature of the rostrum, the much smaller supra-orbital spines, and the absence of distinctly defined antennal spines; the caudal segments, moreover, are not keeled above, as in that species, and they have the posterior lappet of the epimera rounded at the tip.

Description.—The solitary specimen procured, and erroneously referred by the late Dr. v. Willemoes-Suhm to *Gnathophausia zoëa*, is a female, with distinct though rather small incubatory lamellæ. It measures 81 mm. in length.

The form of the body (see figs. 7, 8) is somewhat more slender than that of *Gnathophausia willemoesii*, the anterior division being far less tumid than in that species.

The carapace does not completely cover the trunk, the last segment of which appears in part exposed behind its posterior margin. Both lateral keels are distinctly marked, but the lower one disappears at a short distance within the infero-posterior corners of the carapace, without, as in *Gnathophausia willemoesii*, being continued upwards. The dorsal keel, too, is, as in that species, distinctly marked along the whole back of the carapace, though a small impression may be seen above, at a short distance behind the rostrum. The dorsal spine is rather short, not reaching beyond the first caudal segment. The rostrum does not attain the length of the carapace, but is somewhat coarser in structure than that of *Gnathophausia willemoesii*. It is closely armed with a very considerable number of exceedingly small denticles, continued along

the dorsal crest, and even a short distance back on its base. The supra-orbital spines are rather smaller than in *Gnathophausia willemoesii*, and more divergent, scarcely projecting beyond the eyes. No distinct antennal nor branchiostegal spines are present, the lateral expansions of the carapace forming in lieu thereof only two slight angular projections.

The caudal segments do not exhibit any trace of a dorsal keel, nor does their posterior margin form any dorsal projections. The epimera are very small, scarcely projecting even beyond the ventral face, and their posterior lappet is obtusely rounded at the tip.

The eyes are nearly of the same form as in *Gnathophausia willemoesii*.

The antennal scale (see fig. 9) is rather large, but comparatively not so broad as in the preceding species; its terminal lobe, too, is more produced, and projects very considerably beyond the spine of the outer corner.

As regards the oral appendages, the legs, and the caudal limbs, I need not dwell on the description of these parts, as they are much the same in all species belonging to this section.

Moreover, the telson and uropoda (see fig. 10) do not exhibit any essential difference from the same parts in *Gnathophausia willemoesii*, excepting, perhaps, that the lateral margins of the telson are somewhat more strongly arched in the distal part, and that the apical spines have a short denticle at the outer edge.

Habitat.—The specimen described above was taken in the tropical part of the Atlantic, almost midway between Africa and Brazil.

Station 107, August 26, 1873; lat. 1° 22′ N., long. 26° 36′ W.; depth, 1500 fathoms; Globigerina ooze; bottom temperature, 37°·9.

8. *Gnathophausia elegans*, G. O. Sars (Pl. VI. figs. 1–5).

Gnathophausia elegans, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 8.

Specific Characters.—Form of body very slender. Carapace not completely covering the last segment of the trunk, and wanting the upper lateral keel; the cardio-branchial sulcus distinctly marked. Dorsal spine of moderate length, reaching to the end of the second caudal segment. Rostrum rather elongate, equalling the carapace in length, and distinctly denticulate throughout. Supra-orbital spines well marked, though not very strong; antennal spines exceedingly small; branchiostegal spines wanting. Caudal segments rather slender, not keeled above; epimera small, with the posterior lappet but slightly projecting. Antennal scale with the spine of the outer corner smooth, and projecting a trifle beyond the terminal lobe. Telson linguiform, the apical spines very short, and separated by a denticulated cleft. Length, 56 mm.

Remarks.—This is a very fine and elegant species, somewhat resembling *Gnatho-*

phausia zoëa in its general form, but distinguished both from that and all the other species by the absolute want of the upper lateral keel, and by the distinctly impressed cardio-branchial sulcus.

Description.—Of this species, too, a solitary specimen only was obtained, a female, with distinct though not yet fully developed incubatory lamellæ. Length of the specimen only 56 mm.

The form of the body (see figs. 1, 2) is more slender than in any of the other species, excepting perhaps *Gnathophausia gracilis*, Suhm.

As in the preceding species, the carapace does not cover completely the last segment of the trunk, part of which may be seen exposed behind its posterior margin. It juts out posteriorly as a comparatively strong dorsal spine, which, however, does not project beyond the second caudal segment. Of the lateral keels the lower only is distinctly developed, and this curves obliquely upward in its posterior part, terminating at some distance beneath the base of the dorsal spine. The upper lateral keel, on the other hand, distinct in all the other species of the genus, would seem in this one to be wholly wanting. Only when viewed from the dorsal aspect (fig. 2) can two faint lines be discerned, close to the dorsal keel, which, perhaps, may be regarded as corresponding to these keels, but, if so, they have a most anomalous position. The rostrum is rather elongate, attaining the length of the whole carapace, and is coarsely denticulate, the denticles being continued along the upper crest to the base itself, becoming here very small and crowded together. The supra-orbital spines are distinctly developed and somewhat upturned. On the other hand, the antennal spines are exceedingly small; and of the branchiostegal spines no trace whatever can be discerned, the lateral expansions of the carapace behind the antennal spines being evenly rounded, as in *Gnathophausia willemoesii*.

The caudal segments are rather slender, and, as in *Gnathophausia affinis*, without any keel or dorsal projections. The epimera are very small, the posterior lappet scarcely projecting beyond the ventral face. The last segment is conspicuously longer than the preceding, and its two sections very distinctly marked off.

The eyes, as in the two preceding species, are quite short, and clavate in form.

The antennal scale (fig. 3) is more than double the length of the antennular peduncle, and of a form rather similar to that in *Gnathophausia affinis*, with this difference, however, that the terminal lobe is much less produced, the spine of the outer corner projecting considerably beyond it. This spine, too, contrary to what is the case in the following species, is quite smooth.

The telson (fig. 4) exhibits the usual linguiform shape, the lateral margins being rather strongly curved in their distal part, and densely spinulose. The apical spines are somewhat short and thick, armed at the outer edge with a small tooth, and separated in the middle by a distinctly angular cleft, fringed with small denticles (see fig. 5).

Habitat.—The above described specimen was taken in the Pacific Ocean, south of the Fiji Islands.

Station 174c. August 3, 1874; lat. 19° 7′ 50″ S., long. 178° 19′ 35″ E.; depth. 610 fathoms; coral mud; bottom temperature, 39°·0.

9. *Gnathophausia zoëa*, Willemoes-Suhm (Pl. VI. figs. 6–10).

Gnathophausia zoëa, Suhm, Trans. Linn. Soc. Lond. (Zool.), ser. 2, vol. i. p. 32, pl. ix. figs. 2–15, pl. x. fig. 4, 1875.

Gnathophausia zoëa, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 9.

Gnathophausia zoëa, A. Milne-Edwards, Recueil de Figures de Crustacés nouveaux ou peu connus, I^e^ livraison (two last plates). Paris, April, 1883.

Specific Characters.—The body not so slender as in the two last species. Carapace rather large, completely covering whole of trunk, and produced behind as a very large dorsal spine, in some specimens jutting out even beyond the fourth caudal segment. Posterior margin of carapace in upper part coarsely denticulate, the denticles continued along the lateral edge of the dorsal spine. Both lateral keels distinct. Rostrum very elongate, even exceeding the carapace in length, and strongly denticulate throughout. Supra-orbital and antennal spines well marked and considerably projecting; branchiostegal spines wanting. Caudal segments slightly keeled above, and produced posteriorly into small spines; posterior lappet of epimera acutely pointed. Antennal scale with spine of outer corner somewhat projecting beyond the terminal lobe, and slightly denticulate at the outer edge. Telson of the usual form, the apical spines connected by a thin serrate lamella. Length reaching 70 mm.

Remarks.—This form has been well described and figured by the late Dr. v. Willemoes-Suhm in the above cited treatise, and several figures of the same species have also been prepared by Professor A. Milne-Edwards on two plates, belonging to a collection of drawings of Crustacea, recently published by that author. It may readily be distinguished from the preceding species by the very strong development of the dorsal spine, from which character, indeed, the specific denomination "*zoëa*" has been derived, this name, as is well known, being generally applied to a larval stage of Brachyura, prominently distinguished by the presence of a large dorsal spine issuing from the dorsal surface of the carapace.

Description.—No less than five specimens of this striking form were procured on the Challenger Expedition from different localities. Of these, two are females and three males, all agreeing very closely in all essential characters. The largest of the specimens, a male, attains a length of about 70 mm.

The form of the body (see figs. 6, 7) is somewhat more robust than in the three preceding species, the anterior division being rather more dilated, and the tail not so slender.

The carapace is very large, covering the whole of the trunk, and even somewhat overlapping the anterior part of the first caudal segment. It juts out posteriorly into a remarkably strong dorsal spine of somewhat varying length, but in some specimens projects, when the tail is extended, even beyond its fourth segment. This spine, too, is rather broad at the base, and gradually tapers toward the apex, which is sharply pointed. Both lateral keels of the carapace are distinctly marked, the lower one being placed rather far down, and, as in *Gnathophausia willemoesii*, curving abruptly upward at a short distance from the infero-posterior corners of the carapace, running parallel to the posterior margin, and joining the upper lateral keel at the base of the dorsal spine. The upper part of the posterior margin of the carapace is armed with strong denticles, resembling the teeth of a saw, and these are continued for some distance along the lateral edges of the dorsal spine. The dorsal keel is quite uninterrupted, running along the whole dorsal surface of the carapace, and continued anteriorly on the rostrum, posteriorly on the dorsal spine. The rostrum attains a very considerable size, even exceeding in length the whole carapace, if the dorsal spine be excepted, and is distinctly denticulate throughout. The supra-orbital spines (fig. 8, *a*) are strongly developed, and project far beyond the eyes. The antennal spines (*b*) also attain a comparatively considerable length. On the other hand, the branchiostegal spines are wholly wanting, the lateral expansions of the carapace (*c*) being evenly rounded off, as in *Gnathophausia willemoesii* and *Gnathophausia elegans*.

The five anterior caudal segments are slightly keeled above, and, at the posterior margin, produced as short posteriorly directed spines. The epimera project rather more than in the two species last described, their posterior lappet being acutely pointed.

The eyes, as in the other species belonging to this section, are rather short, and pyriform in shape.

The antennal scale (fig. 9) has much the same form as in *Gnathophausia elegans*, differing only in the spine of the outer corner being slightly serrate along the outer edge.

The telson (see fig. 10) also exhibits a very similar appearance to that in the preceding species, but the apical spines are here connected by a thin but distinct lamella, regularly serrate on its free edge.

The uropoda (*ibid.*) do not quite reach the apex of the telson, and are, in other respects, very similar in structure to those of the other species belonging to this section.

Colour.—According to the statements of Dr. v. Willemoes-Suhm, the Rev. Dr. Norman, Professor A. Milne-Edwards, and the Marquis de Folin, the colour of this form is a magnificent blood-red or carmine.

Habitat.—The specimens procured by the Challenger Expedition were collected at the following localities :—

Station 73, June, 30, 1873; lat. 38° 30′ N., long. 31 14′ W. (North Atlantic, west of the Azores); depth, 1000 fathoms; Pteropod ooze; bottom temperature, 39°·4.

Station 106, August 25, 1873; lat. 1° 47′ N., long. 24 26′ W. (Tropical Atlantic); depth, 1850 fathoms; Globigerina ooze; bottom temperature, 36°·6.

Station 126, September 12, 1873; lat. 10° 46′ S., long. 36 8′ W. (off Rio San Francisco, Brazil); depth, 770 fathoms; red mud.

Station 171, July 15, 1874; lat. 28° 33′ S., long. 177° 50′ W. (Pacific, north of the Kermadec Islands); depth, 600 fathoms; hard ground; bottom temperature, 39°·5.

Distribution.—As may be inferred from the above specified localities, the geographical distribution of the present species is very extensive, ranging from the North Atlantic to the Pacific Ocean. The species also inhabits, as stated above, the seas of Europe, having been found by the French expedition in the Bay of Biscay.

10. *Gnathophausia longispina*, G. O. Sars (Pl. VII. figs. 1–5; Pl. VIII.).

Gnathophausia longispina, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 10.

Specific Characters.—Form of body closely approximating to that of *Gnathophausia zoëa*. Dorsal spine very large, finely serrate, both at the dorsal and lateral edges. Rostrum exceedingly elongate and slender, almost twice the length of the carapace, and coarsely denticulate. Supra-orbital spines strongly developed; antennal spines obsolete: branchiostegal spines well marked, triangular, and projecting straight outward. Five anterior caudal segments slightly keeled above, and produced at the middle of the posterior margin into small dorsal denticles: posterior lappet of epimera acuminate, that on the second segment remarkably produced. Anterior section of last segment with two epimeral spines on either side. Eyes short, claviform. Antennal scale remarkably large, with terminal lobe very narrow, the spine of the outer corner exceedingly strong, mucroniform, and greatly surpassing the terminal lobe, coarsely denticulate on both edges, the denticles being continued along the outer margin of the scale almost to its base. Telson and uropoda almost the same as in *Gnathophausia zoëa*. Length reaching 59 mm.

Remarks.—This species, at the first glance, much resembles *Gnathophausia zoëa* in appearance, but may readily be distinguished from it by the still more elongate rostrum, the closely denticulate dorsal spine, the absolute want of antennal spines, the branchiostegal projections being very distinctly marked; and, finally, by the strong development of the antennal scale, and more particularly of the spine issuing from its outer corner.

Description.—Of this species also, no less than five specimens were collected, all in the same locality. One is a female, the remainder being males. The largest

specimen, a male, reaches a length of 59 mm. I have selected a male for anatomical dissection, and have figured the limbs, gills, and the nervous system separately on Pl. VIII., hoping in this way to illustrate more closely the organisation of the genus.

The form of the body (see Pl. VII. figs. 1, 2), although rather similar to that in *Gnathophausia zoëa*, would appear on the whole to be somewhat more slender, the anterior division being less tumid.

The carapace, as in that species, covers the whole of the trunk, without, however, overlapping the anterior part of the first caudal segment. The dorsal spine is strongly developed, projecting, when the tail is extended, to about the end of its fourth segment. It is closely denticulate throughout, the denticles being present not only, as in *Gnathophausia zoëa*, along the lateral, but also on the dorsal edges, and continued forward, moreover, along the dorsal keel of the carapace almost to the verge of the dorsal area. The lateral keels of the carapace are comparatively shorter than in *Gnathophausia zoëa*, but, in other respects, exhibit a perfectly similar appearance. The rostrum is exceedingly elongate and slender, even attaining twice the length of the carapace, and it is perfectly straight, acuminate, and coarsely denticulate throughout. The supra-orbital spines (fig. 5, *a*), as in *Gnathophausia zoëa*, are strongly developed, projecting far beyond the eyes. On the other hand, the antennal spines would seem to be wholly wanting, only a very small rounded prominence (*b*) being observed in their place. The lateral expansions of the carapace, too, project into a strong, acutely triangular lappet, pointing straight outward, and apparently corresponding to the branchiostegal spines.

The five anterior caudal segments are, as in *Gnathophausia zoëa*, slightly keeled above, and exhibit in the middle of the posterior margin a small dorsal projection pointing backward. The epimera project distinctly, the posterior lappet being drawn out into a sharp point, which, on the second segment, is remarkably long and slender. The epimeral plates issuing from the anterior section of the last segment exhibit two small denticles succeeding each other. The terminal spines, placed on each side of the base of the telson, are unusually strong and somewhat upturned.

The eyes, as in *Gnathophausia zoëa*, are rather short and clavate in form.

The antennal scale (Pl. VII. fig. 3), on the other hand, exhibits a rather characteristic appearance. It is very large, and tapers rapidly toward the apex, the terminal lobe being very much narrowed and lanceolate in form. The spine, too, issuing from the outer corner, is enormously developed, decidedly mucroniform, and projects far beyond the tip of the scale; it is also coarsely denticulate on both edges, the denticles, moreover, being continued backward along the outer margin of the scale, almost to its base.

The telson (fig. 4) does not differ materially from that of *Gnathophausia zoëa*, nor do

the several other parts show any essential difference from what is observed in that species.

Habitat.—All the specimens of this species were collected in the same locality, viz., off Samboangan, Mindanao (Philippine Islands).

Station 200, October 23, 1874; lat. 6° 47′ N.; long. 122° 28′ E.; depth, 250 fathoms; green mud.

Section 3.—Infero-posterior corners of carapace produced into two spines. Dorsal spine distinctly projecting. Dorsal keel interrupted anteriorly. Supra-orbital spines small. Antennal scale jointed at apex, outer edge jutting out anteriorly into a strong spine. Maxillipeds with distinctly developed exopodites. Epimeral plates of last segment not united on the ventral face.

11. *Gnathophausia gracilis*, Willemoes-Suhm (Pl. VII. figs. 6–10).

Gnathophausia gracilis, Suhm, Trans. Linn. Soc. Lond. (Zool.), ser. 2. vol. i. p. 33, pl. ix. fig. 1, 1875.

Gnathophausia gracilis, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 11.

Specific Characters.—Form of body very slender. Carapace not very large; dorsal spine short, but distinctly projecting; infero-posterior corners armed with two unequal spines, the upper one being the stronger, and about equalling in length the dorsal spine. Upper lateral keel wanting. Dorsal keel armed in its posterior part with coarse, anteriorly curved denticles. Cervical sulcus distinctly defined. Rostrum elongate and slender, equalling the carapace in length, and distinctly denticulate. Supra-orbital spines very small, and not defined from the base of the rostrum. Antennal spines well-marked; branchiostegal projections exceedingly large, acutely triangular. The two anterior caudal segments with strong dorsal projections; epimera small. Eyes very narrow, cornea scarcely at all expanded. Antennal scale rather slender, terminal lobe small, outer edge serrate in the distal part, spine of outer corner slightly projecting. Telson linguiform, apical projection quadridentate, having besides a small lateral denticle. Length, 41 mm.

Remarks.—This is a rather anomalous species, perhaps most nearly related to the species comprised in the first section, although the antennal scale is developed in the same manner as in the species belonging to the second section. After all it cannot be referred to either of these two sections, but should more properly be regarded as the type of a third section, or subgenus.

Description.—The sole specimen obtained by the Challenger Expedition, and briefly described by the late Dr. v. Willemoes-Suhm, does not appear to have been very carefully handled, being in far from a good state of preservation, the carapace having been partly crushed and disengaged from the body. It has therefore been somewhat difficult for me

to work out the specific characters satisfactorily, as also to give correct figures of the general appearance and form of the body. The specimen has not a trace of incubatory lamellæ, and hence is most likely a male. Its length is only 41 mm.

The form of the body (figs. 6, 7), as compared with the other species of the genus, is very slender, for which reason the late Dr. v. Willemoes-Suhm suggested the specific denomination "*gracilis*."

The carapace is comparatively small, and does not seem to cover completely the last segment of the trunk. It projects posteriorly into a well marked, although rather short, dorsal spine, scarcely reaching beyond the first caudal segment. The infero-posterior corners of the carapace, instead of being rounded off, as in the species belonging to the second section, are somewhat prominent, and jut out into two posteriorly directed spines, of somewhat unequal length, the lower rather short, whereas the upper attains about the length of the dorsal spine. Of the lateral keels, the lower only is distinctly developed, and it runs parallel to the inferior margin of the carapace, terminating at the base of the upper spine, which issues from the infero-posterior corner. Of the upper lateral keels, on the other hand, no trace whatever can be discerned. The dorsal keel is interrupted in the anterior part of the carapace, where a distinct transverse impression is seen to occur, apparently corresponding to the cervical sulcus in other Schizopoda. In the posterior part, however, the keel is well marked, and armed with a row of strong, anteriorly curving denticles. The rostrum is rather elongate and slender, about as long as the carapace, and, as in the other species, three-edged, being also armed with strong denticles, continued along the dorsal edge to some distance posterior to the base of the rostrum. The supra-orbital spines are very small, and not distinctly defined from the base of the rostrum, being placed somewhat anterior to the insertion of the eyes. The antennal spines are well marked, though not very large. On the other hand, the branchiostegal spines are enormously developed, and project on either side as strong wing-like expansions, tapering to a sharp point.

The caudal segments are rather slender, and the five anterior ones are armed with dorsal projections, those on the two foremost being distinguished by their exceedingly large size. On the second segment occur two such projections, of an acutely triangular form, both placed in the middle line, and pointing the one posteriorly, the other anteriorly. On the first segment may also be observed two projections, of which, however, the anterior is very small, whereas the posterior is rather large, and points straight upward. On the other segments, only a small projection is seen in the middle of the posterior margin. The epimeral plates issuing from the anterior section of the last segment are, as in *Gnathophausia longispina*, armed with two small denticles.

The eyes are very small and narrow, the cornea being scarcely expanded, and only occupying the outermost extremity of the eye.

The antennulæ do not seem to exhibit any essential difference from those in other

species of the genus, except, perhaps, that the inner flagellum is comparatively smaller, not nearly reaching the length of the antennal flagellum.

The antennal scale (fig. 8) is about twice as long as the antennular peduncle and rather narrow, almost three times as long as broad, but in other respects exhibiting a structure similar to that observed in the species belonging to the second section of the genus, the terminal part being marked off from the remaining portion of the scale by a distinct oblique suture, and jutting out into a short linguiform lobe. The inner edge of the scale is very slightly arched, and, like the terminal lobe, fringed by a row of comparatively strong bristles. The outer edge, too, is almost straight, and in its distal half slightly serrate, projecting anteriorly into a naked spine of moderate length.

With regard to the oral parts, they cannot of course be accurately examined in the solitary specimen obtained, but would seem on the whole to agree with those in *Gnathophausia longispina*, as described above; with this difference, however, that the maxillipeds, as in the three species belonging to the first section, have distinctly developed exopodites.

The legs and caudal limbs do not exhibit any essential difference from the same parts in the other species of the genus.

The telson (see fig. 9) exhibits the usual linguiform shape, and its length about equals that of the two preceding segments taken together. Its lateral edges are evenly curved in their distal part, and densely spinulose. The apical projection exhibits a form somewhat different from that in the other species (see fig. 10), being drawn out into four acute terminal lappets, or spines, the two outer ones being the largest and smooth, whereas the two inner ones are denticulate along the inner edge, and separated by an angular cleft. Moreover, a short denticle is observed on either side at the outer edge of the projection.

The uropoda (*ibid.*) do not quite reach the tip of the telson, and they exhibit the usual structure, the outer plate being the larger, and having the terminal part marked off as a distinct joint, jutting out in the form of a rather large linguiform lobe, densely fringed with bristles. The outer edge of this plate is considerably less arched than in the other species, and terminates in a very small denticle.

Habitat.—The specimen described above, together with *Gnathophausia affinis*, was taken in the tropical part of the Atlantic Ocean between Africa and Brazil.

Station 107, August 26, 1873; lat. 1° 22′ N., long. 26° 36′ W.; depth, 1500 fathoms; Globigerina ooze; bottom temperature, 37°·9.

Genus 4. *Chalaraspis*, Willemoes-Suhm (*ex parte*).

Generic Characters.—Carapace thin, membranous, of enormous size, covering, in addition to the trunk, the anterior part of the tail, and projecting forwards as a broad frontal plate. Caudal segments with rounded epimera. Eyes small. Antennular

peduncle short and thick, inner flagellum very small. Antennal scale not jointed, outer edge serrate. The two (?) anterior pairs of legs differ slightly from the rest, which are uniform in structure, and true pereiopoda. Telson prolonged, acuminate. Outer plate of uropoda not jointed at apex.

Remarks.—The specimen from which the present genus is established has unfortunately been lost. But to judge from the drawings of the animal made by the late Dr. v. Willemoes-Suhm, it certainly claims to be regarded as the type of a distinct genus among the Lophogastridæ. The generic name *Chalaraspis* has, it is true, been also adopted by that author for another very different Schizopod—*Chalaraspis anguiculata*; but as that form has proved to be identical with Dana's *Eucopia australis*, I have thought fit to retain the generic denomination proposed by Dr. v. Willemoes-Suhm for the remarkable form here treated of, the name being, moreover, a most appropriate one.

12. *Chalaraspis alata*, Willemoes-Suhm MS. (Woodcuts 1, 2).

Specific Characters.—Form of body rather short and thickset. Carapace without either keels or sculpturing, emarginate behind, wholly covering the two anterior segments of the tail, as also a part of the third segment. Cervical sulcus distinct. Frontal plate abruptly truncate, anterior margin finely serrate. Eyes very small and narrow. Antennular peduncle projecting with its two outer joints beyond the frontal plate. Antennal scale not very large, of an oval form, apex rounded. Telson, equalling in length the three

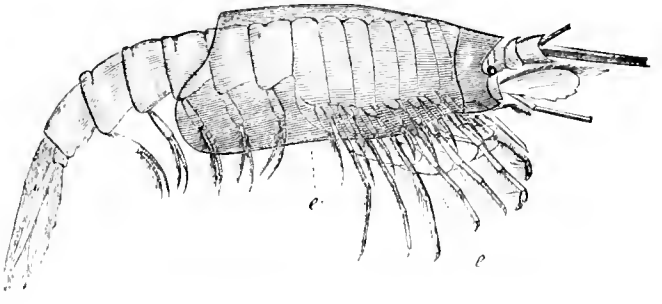


Fig. 1.—*Chalaraspis alata*, Suhm.

preceding segments taken together, rather narrow, and tapering towards the apex. Length, 40 mm.

Remarks.—As above stated, the only specimen obtained by the Challenger Expedition has been lost, and hence I have not myself been enabled to submit the species to a detailed examination. However, the two drawings of this interesting form were fortunately found among the manuscripts of the late Dr. v. Willemoes-Suhm,—the one

exhibiting the animal from the right side, the other as seen from above. The accompanying woodcuts have been executed with the greatest possible accuracy from these drawings, and in the following description are also embodied certain manuscript notes by the same author.

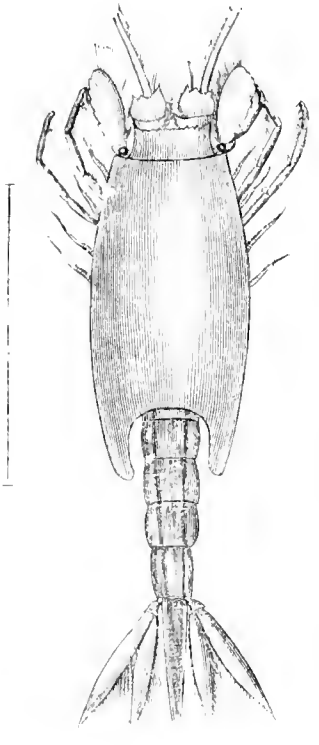


Fig. 2.—*Chalaraspis alata*, Suhm.

Description.—The specimen has, according to the late Dr. v. Willemoes-Suhm, a length of 40 mm., of which the carapace, measured along the upper face, occupies 20 mm.

The form of the body, as will be seen from the figures, is comparatively short and thickset, even more so than in the species of the genus *Gnathophausia*.

The carapace is enormously developed, covering not only the whole of the trunk, but also a very considerable part of the tail, of which the two anterior segments are completely concealed beneath it. It is very thin, membranous, and semi-transparent, and does not exhibit any trace of keels or other sculpturing, nor jut out distinctly into spines. Throughout by far the greater part of its extent, it loosely covers the body like a mantle, being connate with it in its most anterior part only. Posteriorly, it is deeply emarginate, the lateral parts forming broadly rounded and very deep wing-like expansions, overlapping the third caudal segment, and more or less completely concealing at the sides the three anterior pairs of caudal limbs, as also the basal parts of the legs. Anteriorly, it projects as a short, but very broad, frontal plate, abruptly truncate at the extremity, the anterior margin being slightly emarginate and finely serrate, the lateral corners somewhat extended. At a short distance behind the frontal plate a distinctly marked transverse suture occurs, apparently corresponding to the cervical sulcus in other Schizopods. The antero-lateral corners of the carapace form an acute angle. No supra-orbital, antennal, nor branchiostegal spines can be detected.

The caudal segments appear somewhat compressed, and exhibit a slight transverse impression close to the posterior margin. The epimera are evenly rounded, as in *Lophogaster*. The last segment would not seem to be subdivided transversely, and it has a small epimeral spine on either side.

The eyes are very small and narrow, with the cornea but slightly expanded; they project a little on either side of the frontal plate.

The antennular peduncle is short and thick, the basal joint being wholly concealed beneath the frontal plate, whereas the two outer joints project beyond its anterior margin. As in *Gnathophausia*, the last joint juts out on the inner side as a densely setigerous

lobe, pointing forward. Of the flagella, the inner one would seem to be very small, whereas the outer is strongly developed.

The antennal scale is comparatively small, and has no articulation at the extremity. It is oval in form, the apex being rounded off, and the outer edge distinctly serrate.

Of the legs, the two anterior pairs, judging from the figures, would appear to differ somewhat from the rest, their terminal part being a little stronger and more curved. The remaining legs are uniform in structure and not very strong, but have a distinct terminal claw.

The incubatory lamellæ (Fig. 1, *ee*) were well marked in the specimen examined, and were present, as in the other forms of this family, at the bases of all the legs.

The caudal limbs would not seem to differ in structure from those of other Lophogastridæ.

The telson is greatly produced, and very narrow, tapering gradually towards the apex, which is acutely pointed; the lateral edges are almost straight, and in one of the figures appear finely serrate.

The uropoda are rather large, reaching the tip of the telson, and have both plates lanceolate, the outer one being somewhat broader, without, however, exhibiting any articulation at the apex.

Habitat.—The above described specimen was taken in the Southern Ocean, south of Australia.

Station 158, March 7, 1874; lat. 50° 1′ S., long. 123° 4′ E.; depth, 1800 fathoms; Globigerina ooze; bottom temperature, 33·5.

Family II. Eucopidæ.

Remarks.—This family, so far as at present known, contains but a solitary type, viz., the genus *Eucopia*, established by Dana for a remarkable Crustacean obtained by the United States Exploring Expedition, and named by that author *Eucopia australis*. This form was classed by Dana within his division Penæidea, and Mr. Spence Bate has recently[1] adopted the same view in regard to the systematic position of the genus. On the other hand, the late Dr. v. Willemoes-Suhm, who rediscovered the same species during the Challenger Expedition, regarded it as the type of a new family of the Schizopoda. But, having apparently not consulted Dana's work, he described the animal as a new form under the name of *Chalaraspis unguiculata*, and accordingly named the family Chalaraspidæ. In my opinion, the view of Dr. v. Willemoes-Suhm, as to the systematic position of the present form, is undoubtedly quite correct. The earlier name, however, *Eucopia*,

[1] On the Penæidea, *Ann. and Mag. Nat. Hist.*, ser. 5, vol. viii. pp. 169–196, 1881.

proposed by Dana, must be retained, and the family hereafter named Eucopiidæ, in lieu of Chalaraspidæ.

The schizopodous nature of *Eucopia* is apparent both in the powerfully developed natatory branches (exopods) of all the legs, and more particularly in the marsupial pouch of the female, the latter exhibiting precisely the same structure as the same part in the Lophogastridæ. Indeed this last character alone would suffice to distinguish the species as a true Schizopod, no other Podophthalmians possessing, as stated above, a similar characteristic. Moreover, the structure of the oral parts would seem to bear out this assumption, for they are, on the whole, rather similar to those in other true Schizopods. Thirdly, the structure and arrangement of the gills exhibit a striking resemblance to those of the corresponding parts in the Lophogastridæ. On the other hand, however, the very peculiar and anomalous form of the legs would apparently prevent us from ranging this Crustacean within any of the three previously established families of Schizopoda, and for this reason I have seen fit to adopt the view of the late Dr. v. Willemoes-Suhm in regarding it as the type of a separate family.

Genus *Eucopia*, Dana, 1852.

Eucopia, Dana, United States Exploring Expedition, Crustacea, part i. p. 609.
Chalaraspis, Suhm (*ex parte*).

Generic Characters.—Integuments very thin and soft, membranous. Carapace large, covering whole of trunk, deeply emarginate posteriorly, lateral wings produced along the sides of tail; frontal part rounded off, not rostrate. Caudal segments without distinct epimera, smooth. Eyes imperfectly developed. Antennular peduncle rather stout, inner flagellum very small, outer strongly developed. Antennal scale large, jointed at apex. Mandibular palp very slender. Maxillæ rather feeble in structure; first pair without any palp, second pair with very small masticatory lobes, provided with only simple bristles. Maxillipeds furnished with an imperfectly developed exopodite, the epipodite exceedingly large. The three anterior pairs of legs short and strong, developed as gnathopoda; the three succeeding pairs exceedingly slender and elongate, with propodal joint slightly expanded and terminal claw very mobile: last pair filiform, outer part setose. Branchiæ well developed, consisting of three bipinnate ramifications, the inner one projecting beneath the ventral face, the two others covered by the carapace. Pinnulæ of gills irregularly lobular. No branchiæ at base of last pair of legs. Marsupial pouch composed of seven pairs of incubatory lamellæ. Telson rather large, tapering: apex entire, not incised. Outer plates of uropoda jointed at apex.

Remarks.—The genus does not, in my opinion, at present comprise more than a single species, described in detail below. Mr. Spence Bate having examined some of the specimens from the Challenger Expedition, does indeed suggest that one of these is

the representative of a new species, to which he assigns the name of *Eucopia equatoria*, but after a careful examination of this, I feel convinced that it ought to be regarded as a male of *Eucopia australis*, the assumed specific differences being readily accounted for as mere sexual characters.

13. *Eucopia australis*, Dana (Pls. IX. and X.).

Eucopia australis, Dana, United States Exploring Expedition, Crustacea, part i. p. 609; Atlas, pl. xi. fig. 10, *a* to *m*.
Chalaraspis unguiculata, Suhm, Trans. Linn. Soc. Lond. (Zool.), ser. 2, vol. i. p. 37, pl. viii., 1875.
Eucopia australis, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 12.

Specific Characters.—Form of body rather slender, tail tapering backward very considerably, with last segment very elongate. Carapace indistinctly areolate in its anterior part, cervical and branchiostegal lines well marked: lateral wings rounded off at the tip and projecting far beyond the first caudal segment. Frontal margin evenly arched. A slight infra-orbital projection present, but no trace of supra-orbital, antennal, or branchiostegal spines. Eye small, cornea scarcely expanded at all: in male somewhat larger, with darker pigment. Last joint of antennular peduncle produced interiorly into a setiferous lobe. Antennal scale oblong-ovate, apex rounded, outer edge somewhat sinuous, and terminating in a very small denticle. The three anterior pairs of gnathopodous legs in male rather stronger than in female, the propodal joint being greatly swollen; the three succeeding pairs of legs attaining almost the length of the whole body, propodal joint slightly dilated and strongly spinous at the distal part of its inner edge, terminal claw scarcely half as long, straight and spinous at base. Terminal part of telson fringed with unequal spinules, the apex being armed with two straight spines, between which two small bristles are attached. Uropoda attaining length of telson, outer plate obliquely truncate at apex, with three small denticles at the end of the straight outer edge. Length reaching 50 mm.

Remarks.—There cannot, I think, be any doubt whatever that this form is identical with Dana's *Eucopia australis*. The author in question, it is true, does not describe the very peculiar structure of the three pairs of legs preceding the last, but merely remarks that the four posterior pairs are very long and slender, from which it might be inferred that all these pairs have had a uniform appearance in Dana's specimen. It must, however, be borne in mind that the solitary example described by Dana was not in a very good state of preservation, having been taken from the stomach of a penguin, and Dana, moreover, states, that the four posterior pairs of legs were partly broken. In all other respects the figures and description of Dana agree sufficiently well with the form here treated of, and described by the late Dr. v. Willemoes-Suhm under the name of *Chalaraspis unguiculata*.

Although the present species would seem to be widely distributed, and a rather plentiful supply of specimens was collected by the Challenger Expedition, it has proved a matter of no small difficulty to make out its anatomy and to arrive at a correct idea of the general appearance of the animal, most of the specimens, owing to their great fragility, being in a rather imperfect state of preservation, and having lost a more or less considerable number of their limbs. However, by comparing all the specimens, and supplying from one what is wanting in another, I have finally succeeded in attaining a tolerably complete knowledge of the organisation of this remarkable Crustacean, and at the same time have been enabled to confirm the statements of the late Dr. v. Willemoes-Suhm, as to certain important characteristics omitted in the description given by Dana.

Description.—The length of the largest specimen, a female with remarkably developed marsupial pouch, is 50 mm.

All the integuments are very thin and soft, almost membranous, and hence the general form of the body has in most cases been somewhat altered by the action of the spirit or by accidental pressure.

In the best preserved specimens, the body exhibits (see Pl. IX. figs. 1, 2; Pl. X. fig. 1) a rather slender form, the anterior division being almost cylindrical, the posterior tapering rapidly towards the end.

The carapace is very large, and, as in *Gnathophausia*, connate with the body in its most anterior part only, but otherwise loosely covering the trunk, all the segments of which are distinctly defined in their whole circumference (see Pl. X. fig. 2), the last being perceptibly larger than the others. It is deeply emarginate posteriorly, without, however, as stated by Dana, leaving any of the segments of the trunk uncovered. The lateral wings are rather produced, and rounded at the tip, extending laterally along the anterior part of the tail and reaching far beyond its first segment, in some specimens almost to the end of the second (see Pl. IX. fig. 1). The inferior margins, too, are very slightly arcuate, covering in part the bases of the legs, and terminating anteriorly in an obtuse angle. The anterior part of the carapace exhibits above an indistinctly areolate appearance, two transverse depressions, one of which may be the cervical sulcus occurring here, partly crossed by a slight longitudinal depression on either side. Moreover, the branchiostegal line, marking off the linguiform dorsal area, is distinctly perceptible (see Pl. IX. figs. 1, 2). The frontal margin is evenly curved, not forming any rostral projection, and leaving the ocular segment uncovered. Beneath and somewhat external to the eyes, on either side, a slight projection is seen, apparently corresponding to the infra-orbital spine in other Podophthalmians. On the other hand, no trace whatever can be found of either supra-orbital or of antennal and branchiostegal spines.

The caudal segments do not exhibit any distinctly developed epimera, being evenly rounded both ventrally and dorsally. They rapidly diminish in breadth posteriorly, and

the last segment is very much compressed, as also exceedingly elongate, equalling in length the three preceding segments taken together.

The eyes (see Pl. IX. fig. 3) in the female are very small, and nearly cylindrical, with the cornea not in the least expanded, and are furnished with a whitish pigment. The visual elements would also seem to be most imperfectly developed. In the male (see Pl. X. fig. 13) the eyes are rather larger and thicker, with a darker pigment, but here, too, the visual elements do not exhibit any complete development. Both in the male and the female a distinctly marked ocular papilla is seen projecting anteriorly over the upper part of each cornea. The ocular segment projects anteriorly as a broadly rounded lobe, reaching a trifle beyond the insertion of the eyes (see Pl. IX. fig. 3).

The antennular peduncle (see Pl. IX. fig. 3) is rather stout, and somewhat flattened throughout. Its basal joint is almost as large as the two other joints taken together, and finely setiferous along the inner edge, as also partly on the upper face; its outer edge exhibits a few (three) somewhat stronger plumose bristles, and terminates in an almost perfect right angle, from which proceed a bundle of similar bristles. The second joint is rather short, and connected with the last by a very oblique suture, running from without inwards. The last joint has the inner edge sharpened and projecting anteriorly as a triangular lobe, with a fringe of dense and very long plumose bristles, carried along the whole of the inner margin. The inner flagellum is very small, only slightly exceeding the peduncle in length. The outer, on the contrary, is most powerfully developed, equalling, it may be, the whole body in length. In none of the specimens, however, is the outer flagellum quite complete, a more or less considerable portion being invariably broken off.

The antennal scale (see Pl. IX. fig. 4) is rather large, projecting far beyond the antennular peduncle, and in form is somewhat oblong-ovate, slightly tapering toward the apex. The outer edge is a trifle arched in its proximal part, and terminates in a very small dentiform projection; the inner edge is very slightly arcuate, and the apex forms a broadly rounded lobe, marked off from the remaining part of the scale by a distinct oblique suture, and fringed with a dense row of long bristles, carried along the entire inner edge of the scale. The flagellum is strongly developed, the basal part consisting as usual of three joints,—the last by far the largest,—and the terminal part, according to the statement of the late Dr. v. Willemoes-Suhm, even exceeding the whole of the body in length.

The anterior lip (see Pl. IX. fig. 5) forms a rounded triangular prominence, somewhat narrower than the same part in *Gnathophausia*.

The posterior lip (fig. 8) has the lateral lobes somewhat expanded and irregularly rounded off, their inner edges being finely ciliated.

The mandibles (see fig. 5) exhibit, in respect of their body, a structure very similar to that in the Lophogastridæ, the cutting edge being irregularly and coarsely dentate, and exhibiting, moreover, a small molar area posteriorly. The palp, on the other hand, is very

slender and elongate, almost twice as long as the body, the middle joint being much the largest, and furnished on both edges with slender bristles. The last joint is rather small, scarcely attaining one-third of the length of the middle joint, and having the distal part of the inner edge slightly emarginate, and armed with a dense row of bi-articulate spinules, and likewise with a series of simple bristles.

The first pair of maxillæ (fig. 9) are rather small, without any trace of a palp or an exognath. Of the two masticatory lobes, the outer is much the stronger, and is armed at the abruptly truncated tip with a double row of strong spines (fig. 10). The inner lobe is exceedingly small, triangular, and furnished with a single apical seta, as also a few very small bristles on the outer margin.

The second pair of maxillæ (fig. 11) are decidedly membranous throughout, exhibiting a structure most resembling that in *Lophogaster*. As in that genus, the palp is very small, although distinctly bi-articulate. The masticatory lobes are unusually short, and, as is also the case with the outer joint of the palp, provided with but a few simple bristles. The outer lobe is slightly bifurcate at the apex. The exognath is very large, elliptical, and fringed with a dense row of very strong, plumose setæ. No projection could be observed at the outer side of the basal part.

The maxillipeds (fig. 12) exhibit on the whole a structure very similar to that in *Lophogaster*, but appear somewhat more membranous. The basal part is rather broad, and filled up with the strong muscles giving movement to the epipodite. The five-jointed, incurving terminal portion, or palp, is scarcely as long as the basal part, and setose on both margins. Its last joint (dactylus) terminates in a strong spine, and is provided, at the inner edge, with three smaller spines, and also a few short bristles. The exopodite is rather small, and has the form of a simple, narrow plate, fringed with plumose setæ. The epipodite, on the other hand, is enormously developed, lanceolate in form, and of a very soft and almost spongy structure.

The legs, as stated above, exhibit a very peculiar structure, and are, contrary to what is observed in other Schizopods, rather dissimilar in appearance. All, however, having powerfully developed natatory branches, or exopods, point out their schizopodous nature.

The three anterior pairs of legs (see Pl. IX. figs. 13, 15, 17) are rather short and powerful in structure, generally inclining toward the oral parts, and from this feature they would seem to be endowed with the function of true gnathopoda. They increase somewhat in length posteriorly (see fig. 1), the anterior pair, corresponding to the gnathopoda in other Schizopoda, being less powerfully developed and more membranous in structure than the two remaining pairs; they are also furnished with longer bristles. In all of them the basal joint is somewhat produced, transversely oval, constituting with the remaining part of the leg a strong elbow-shaped curve. The carpal joint is rather elongate, and furnished in the two anterior pairs (figs. 13, 15), at the distal part of the

inner edge, with a dense row of slender spinules, in addition to the usual bristles. The propodal joint in the first pair (fig. 13) is quite simple, and scarcely dilated at all, forming therefore no palmar margin. In the two succeeding pairs (figs. 15, 17), however, this joint is conspicuously dilated, and forms, at the end of the inner edge, a more or less distinctly marked palmar margin (figs. 16, 18). The terminal joint or dactylus, in the first pair (fig. 13), is almost straight, in the two other pairs (figs. 16, 18), on the contrary, strongly curved, and denticulate at the inner edge, as also very mobile, admitting of being bent in toward the palmar margin of the propodus. In the male, these two pairs of legs (see Pl. X. figs. 14, 16) are much more powerful than in the female, the propodus being exceedingly dilated and filled up with strong muscles moving the curved dactylus.

The three succeeding pairs of legs (see Pl. X. figs. 1, 5) are very remarkable, not only by reason of their extraordinary length and slender form, but on account of their anomalous structure. They almost equal the whole body in length, if the caudal fan be excepted, and, in the specimens preserved in spirit, generally exhibit a strong elbow-shaped curve at the junction between the ischial and meral joints, the proximal section of the legs being more or less directed backward, whereas the terminal section extends at right angles with it anteriorly, reaching far in advance of the fore part of the body (see Pl. X. fig. 1). They all exhibit a very similar structure, except that the basal joint diminishes rapidly in length posteriorly, while the terminal section of the leg in a corresponding degree increases in length, though more slightly. Hence they all reach, when stretched out anteriorly, to about the same transverse line. Of the several joints, the basal one is quite remarkable for its considerable length, more especially in the first of the above pairs (fig. 5). The proximal part of this joint is somewhat dilated, and strongly curved, whereas the distal part is very slender, and, in the first of these pairs, projects even far beyond the tip of the exopod. The ischial joint is comparatively short, and somewhat dilated at the end, where it contains the muscles moving the terminal section of the leg. This is exceedingly slender, and, like the remaining part, but very sparingly beset with short bristles. The meral joint is a trifle longer than the carpal, and somewhat curved. The propodus, too, is somewhat shorter than the carpus, and slightly dilated at the base, tapering toward the apex, and exhibiting at the distal part of the inner edge a distinctly marked palmar margin, armed with long, slender spines. The terminal joint, finally, forms an exceedingly movable, almost straight, claw, spinulose at the inner half, and admitting of being bent closely in towards the palmar margin. As to the function of these peculiarly formed legs, it is difficult to form a definite opinion, without having observed the living animal. They would not seem to be specially adapted for the usual ambulatory motion, but are more likely used for the purpose of seizing hold of any delicate submarine objects, as Hydroids or Crinoids, fixed at the sea bottom.

The last pair of legs (see Pl. X. fig. 2) are rather elongate, though falling considerably short of the length of the three preceding pairs, nor do they exhibit their

very slender form. They are nearly of the same thickness throughout, and rather abundantly furnished with bristles. The terminal joint has not the appearance of a claw, but is linear in shape, and very densely setigerous, more especially at the inner edge, the apex being obtusely rounded.

The gills (see Pl. X. fig. 2) occur at the bases of all the legs, except the last, and present alike in their arrangement and structural details a great resemblance to the same organs in *Gnathophausia*. They are divided into three principal branches, the largest bent in towards the ventral face (see Pl. IX. fig. 14), whereas the two others are wholly covered by the lateral parts of the carapace. Every branch is more or less distinctly bipinnate, and the pinnulæ are divided into numerous rather irregularly disposed, lobular projections (see Pl. X. fig. 3). In the interior of the lobules small opaque granular bodies are scattered, apparently blood-cells, similar to those observed within the several oral parts, and also to some extent within the legs. In the male, the gills (see Pl. X. figs. 14, 16) are, on the whole, precisely similar to those in the female, excepting that the inner branch (fig. 15) is somewhat larger and more decidedly arborescent, the pinnulæ being in part subdivided.

The marsupial pouch in one of the specimens obtained (Pl. IX. fig. 1) is very large, and projects considerably beneath the trunk. As in the Lophogastridæ, it is composed of seven pairs of large ovato-lanceolate lamellæ, setigerous at their edges (fig. 15), and each overlapping the other in the median line.

The caudal limbs (Pl. X. fig. 8), as in the Lophogastridæ, are developed in both sexes into powerful natatory organs, the terminal branches very slender and subdivided into numerous short setigerous joints. In the male these limbs (fig. 17) are somewhat more strongly developed than in the female, the basal part being rather more dilated, and exteriorly jutting out into a rounded lobe. In both sexes the inner branch is a trifle shorter than the outer.

The telson (see Pl. X. fig. 9) is rather elongate and slender, gradually tapering in its outer part toward the apex, which is narrowly truncate. The lateral edges of the telson are in the distal part armed with a row of rather strong but somewhat unequal spinules, and two similar but considerably longer ones occur on the apex, in addition to two small bristles in the middle.

The uropoda (*ibid.*) somewhat exceed the telson in length, and have the inner plate lanceolate, the outer rather broader and obliquely truncate at the apex, or projecting as a short terminal lobe, marked off from the plate by a distinctly defined transverse suture. The outer edge of this plate is perfectly straight and bare, terminating in an obtuse angle, from which issue three short denticles (see fig. 11).

The caudal fan of the male agrees precisely in all its details with that of the female.

Nervous System.—In extracting the ventral cord from the specimen selected for anatomical examination, I failed to discover more than seven ganglia belonging to the

anterior division of the body (see Pl. X. fig. 12), and therefore at first supposed the foremost to have been very possibly lost in dissection. Subsequently, however, I learnt that Mr. Spence Bate, too, did not find a greater number in the specimen he dissected, and, moreover, that this zoologist has found the last segment of the trunk to want a separate ganglion, a feature likewise shown to characterise several forms of the Penaeidea. The ganglion belonging to the penultimate segment of the trunk, according to the statement of the same author, besides furnishing that segment and its appendages with nerves, also sends off on each side a nerve to the last pair of legs. Hence, the total number of ventral ganglia belonging to the anterior division of the body, counting those that supply the oral parts with nerves as one, would not strictly be more than seven.

In regard to the structure of the ganglia (see Pl. X. fig. 12) they exhibit, as in *Gnathophausia*, a very similar appearance, forming rounded masses of granular nerve-substance, connected by distinct fibrous commissures. Those of the anterior division of the body are perfectly uniform in size, and somewhat larger than the caudal ganglia. The commissures, too, connecting the ganglia of the trunk are rather thick, and lie close together in such a manner as readily, at the first glance, to be taken for single, while those between the caudal ganglia are distinctly separated and rather long. In addition to a strong nerve-trunk, proceeding from either side of the ganglia and supplying the corresponding pair of limbs with nerves, another pair of nerves is seen to originate from the commissures themselves, apparently innervating the muscles of the body.

Colour.—According to the statement of the late Dr. v. Willemoes-Suhm, the animal exhibits, in a fresh state, a bright red colour throughout.

Habitat.—The specimens procured by the Challenger Expedition were collected from the following seven localities:—

Station 50, May 21, 1873; lat. 42° 8′ N., long. 63° 39′ W. (North Atlantic, south of Nova Scotia); depth, 1250 fathoms; blue mud; bottom temperature, 38°·0.

Station 73, June 30, 1873; lat. 38° 30′ N., long. 31° 14′ W. (North Atlantic, west of the Azores); depth, 1000 fathoms; Pteropod ooze; bottom temperature, 39°·4.

Station 92, July 26, 1873; lat. 17° 54′ N., long. 24° 41′ W. (Tropical Atlantic, north of the Cape Verde Islands); depth, 1975 fathoms; Globigerina ooze.

Station 107, August 26, 1873; lat. 1° 22′ N., long. 26° 36′ W. (Tropical Atlantic, about midway between Africa and Brazil); depth, 1500 fathoms; Globigerina ooze; bottom temperature, 37°·9.

Station 146, December 29, 1873; lat. 46° 46′ S., long. 45° 31′ E. (Southern Ocean, between Cape of Good Hope and Kerguelen); depth, 1375 fathoms; Globigerina ooze; bottom temperature, 35°·6.

Station 158, March 7, 1874; lat. 50° 1′ S., long. 123° 4′ E. (Southern Ocean,

south of Australia); depth, 1800 fathoms; Globigerina ooze; bottom temperature, 33°·5.

Station 237, June 17, 1875; lat. 34° 37′ N., long. 140° 32′ E. (North Pacific, off Kanagava, Japan); depth, 1875 fathoms; blue mud; bottom temperature, 35°·3.

It should, however, be stated that, in all probability, this form was observed during the course of the Expedition in many localities other than those enumerated above. But the great fragility of the animal may in most cases have rendered the specimens, when brought up in the dredge or trawl, so very defective as apparently to leave them worthless for preservation. Thus the late Dr. v. Willemoes-Suhm says, he was "almost sure to get at least a fragment of this Crustacean whenever, in the Mid Atlantic, true deep-sea animals came up in the dredge or trawl."

The specimen described by Dana was from the Antarctic Ocean, lat. 66° 12′ S., long. 149° 44′ E.

As will appear from the above named localities, this Schizopod would appear, on the whole, to be a true deep-sea form, ranging, as it does, from a depth of 1000 to 1975 fathoms. It is worthy of remark, however, that the specimen described by Dana was taken from the stomach of a penguin; and, as it cannot be reasonably assumed that any air-breathing animal can descend to the enormous depths stated above, the said form may also be considered as occasionally occurring at a less considerable depth. It would seem, too, that this view is in part corroborated by the statement of the late Dr. v. Willemoes-Suhm, who says that in the Atlantic this species is met with at depths ranging from 350 to 2500 fathoms.

Distribution.—The late Dr. v. Willemoes-Suhm observes concerning this form that "it is the commonest Schizopod of the deep-sea fauna, and seems to enjoy a very wide bathymetrical and geographical distribution." Indeed its geographical range, as may be seen by comparing the above stated localities, is quite astounding, for it is met with not only throughout the great depths of the Atlantic, but also in the Antarctic Ocean, the Australian Seas, and even in the Pacific, as far north as Japan. No less perplexing, too, would appear the bathymetrical range of the species, descending, as it does, according to the statement of Dr. v. Willemoes-Suhm, to the enormous depth of 2500 fathoms, while, on the other hand, the fact of its forming occasionally the food of penguins would seem to give evidence of its occurrence, in the Antarctic Ocean, at a not very considerable depth below the surface of the sea.

Family 3. Euphausiidæ.

A very considerable number of forms belonging to this interesting family was collected by the Expedition. As most of the species lead a truly pelagic existence, the very

extensive use of the surface-net on the Expedition proved highly successful. In regard to the capture of Euphausidians this may pre-eminently be said to be the case, scarcely a single haul failing to yield some of the forms comprised in this group, either adult or larval. I have carefully gone over a vast number of surface gatherings, kindly sent me by Dr. John Murray, and from these have selected every form that belongs to the Euphausiidæ. A large proportion of the specimens thus brought together represent various stages of development; and it has therefore been a matter of no slight difficulty to determine in each case with full certainty whether the specimens should be regarded as adults, or whether merely as younger animals. I have been equally perplexed in attempting to refer the larval forms accurately to the several species. Meanwhile, a careful study of numerous specimens has finally enabled me to trace the development of at least three different forms belonging to as many genera, and I shall give a detailed account of these researches when treating of the development of the Euphausiidæ.

The total number of species represented in the collection amounts to no less than twenty-seven, comprising seven distinct genera, of which four are new.

I give below a synopsis of the genera, worked out from the structure of the legs.

Legs	nearly uniform in structure, and similar in appearance to the maxillipeds.	Both the two posterior pairs quite rudimentary,		*Euphausia*, Dana.
		Last pair only rudimentary; penultimate pair	of same appearance as preceding,	*Thysanopoda*, M.-Edw.
			with outer joints of stem confluent,	*Nyctiphanes*, G. O. Sars.
		All the legs distinctly developed,		*Benthenphausia*, n. gen.
	somewhat unequally developed, one of the anterior pairs being greatly elongate.	First pair of legs greatly produced and	rather strong, the two last joints armed with spiniform bristles on both margins,	*Thysanoëssa*, Brandt.
			very slender, filiform, naked, with only a tuft of apical bristles,	*Nematoscelis*, G. O. Sars.
		Second pair of legs greatly produced; penultimate joint dilated, and forming, together with the last one, a kind of prehensile hand,		*Stylocheiron*, G. O. Sars.

Genus 1. *Euphausia*, Dana, 1852.

Euphausia, Dana, United States Exploring Expedition, vol. xiii., Crustacea, part i. p. 639.

Generic Characters.—Carapace with antero-lateral angles but slightly produced, rostral projection, as a rule, small. Tail powerfully developed. Eyes of normal structure. Antennular peduncle alike in both sexes, cylindrical, basal joint sometimes provided at the end superiorly, with a small lappet; both flagella elongate, and consisting of numerous joints.

Second pair of maxillæ with terminal joint very broad, exognath comparatively small. First pair of legs nearly similar in structure to maxillipeds and succeeding legs, save that the terminal joint is somewhat expanded and armed with a fascicle of short spines. The two last pairs of legs quite rudimentary, being present only as minute, setiferous processes. The four anterior pairs of gills forming single, curved stems, fringed with a row of narrow gill-sacs; the three posterior pairs much more complex, sending off a branch interiorly; exterior branch in last pair to a greater or less degree abundantly arborescent. The usual number of luminous globules present.

Remarks.—This genus was established by Dana, who distinguished it from the genus *Thysanopoda*, M.-Edw., chiefly by the rudimentary character of the two posterior pairs of legs. This, indeed, would seem to be one of the most striking features by which the present genus may be distinguished from other genera of Euphausiidæ. Moreover, the structure of the gills is somewhat different from that in other forms of this family.

The genus at present comprises no less than eleven different species, all of which are represented in the Challenger collection. Of these, four only have been previously recorded, the other seven being new. The Arctic species established by Krøyer under the names of *Thysanopoda inermis*, *Thysanopoda neglecta*, and *Thysanopoda longicaudata*, which I previously referred to the present genus, ought to be comprised within a distinct genus, *Boreophausia*, G. O. Sars, not represented in the Challenger collection.

Since the genus *Euphausia* may be regarded as the type of the family, I have deemed it advisable, before passing on to the special description of the species, to give a general account of its organisation, as gathered from a careful dissection of several specimens belonging to one of the species, *Euphausia pellucida*, Dana.

General Description of the Genus.—The form of the body (see Pl. XI. figs. 1, 2; Pls. XIII.–XVI.) is generally rather slender, and somewhat compressed, with the tail powerfully developed and always much longer than, sometimes even exceeding twice the length of, the anterior division.

All the integuments are very thin and translucent, admitting of the muscles of the body, and also certain of the viscera, being more or less distinctly traceable through them.

The carapace, as in other Euphausiidæ, is comparatively small, leaving the bases of the legs, with their gills, bare, and posteriorly it does not completely cover the last segment of the trunk, a portion of which always appears exposed above. Differing from all other families of Schizopoda, it is, moreover, connate with the trunk along the whole of the median line, in such a manner that none of the segments, excepting the last, appear completely defined dorsally. Regarding its structure, it is very thin and pellucid, without any kind of sculpture, save a slight transverse depression on its anterior part, representing the cervical sulcus. Posteriorly it exhibits in the middle a conspicuous emargination, encompassing the exposed dorsal part of the last segment of the trunk. The lateral wings of the carapace are evenly rounded, and project a little over the sides

of the first caudal segment, being also partially overlapped by a lamellar projection extending anteriorly from this segment. The anterior part of the carapace is generally slightly keeled above, and projects into a more or less marked rostral process. The antero-lateral corners of the carapace are very slightly produced, exhibiting at the sides of the basal part of the antennæ a small dentiform projection, apparently corresponding to the antennal spine in other Podophthalmia.

The five anterior caudal segments are provided with distinctly developed lamellar epimera, projecting beyond the ventral face and pointing obliquely backwards. The last segment is much narrower than the preceding ones, and rather compressed, without any trace of epimera, but usually armed beneath its end with a compressed tooth, placed immediately anterior to the anal opening (preanal spine).

The eyes are well developed, and generally of a pyriform shape, having the pedicle composed of two segments, and the cornea expanded, globular, with a very dark pigment, and distinctly developed visual elements. Moreover, they invariably contain within the pedicle posteriorly and somewhat inferiorly a peculiar, highly luminous, organ (Pl. XI. figs. 7, *b*, 8), more fully described in the sequel. Between the bases of the eyes, too, may be observed a small but distinct spot of black pigment (the larval eye), apparently containing anteriorly a minute refracting body (see Pl. XI. fig. 7, *a*).

The antennular peduncle (see Pl. XII. figs. 1, 2) is rather elongate, always projecting far beyond the antennal scale, and cylindrical in form, with its three joints gradually diminishing in size. The structure is precisely the same in both sexes. The basal joint is somewhat flattened in its proximal part, and in some species exhibits at the end, above, a small membranous lappet. Moreover, it is furnished with several finely ciliated bristles, of which a dense fascicle is seen issuing from the outer corner. The last joint exhibits a longitudinal keel, and exteriorly, at the end, a small lobe, from the base of which issue two densely ciliated bristles. Both the flagella are rather elongate, though far from attaining the length of the body, and consist of numerous small articulations. The outer flagellum has at the base a slight intumescence, beset with a fascicle of translucent sensory bristles.

The basal part of the antennæ (see Pl. XII. figs. 5, 6) is rather large, and divided into two indistinctly defined segments, of which the proximal exhibits on the ventral face a small opening, surrounded by a somewhat tubular projecting border, the outlet of the so-called "green gland." The distal segment juts forth at the end exteriorly beneath the scale, as a more or less elongate spine. The terminal part of the antenna consists of a rather elongate three-jointed peduncle and a slender multi-articulate flagellum, somewhat longer than the flagella on the antennulæ. The scale is more or less elongate-ovate in form, having the outer edge straight and naked, terminating also in a very small dentiform projection, sometimes, however, obsolete. The apex is truncated, and, like the inner edge, fringed with a dense row

of ciliated setæ. No trace of any apical articulation occurs either in this or in other genera of Euphausiidæ.

The anterior lip (see Pl. XI. fig. 6, *l*; Pl. XII. fig. 7) forms a triangular fleshy prominence, placed between the basal parts of the antennæ, and to some extent concealing the inner ends of the mandibles. It projects anteriorly into a sharp point, and exhibits, on the lower face, a thin transverse membrane, doubling over the body from behind, and deeply incised in the middle.

The posterior lip (Pl. XII. fig. 8) is formed of two membranous lobes, of triangular form, separated by a deep incision almost to the base. The inner edges of these lobes are finely ciliated throughout.

The mandibles (see Pl. XI. fig. 6, *m*; Pl. XII. fig. 9) have a rather strong, curved body, with the masticatory part securiform-expanded. The cutting edge is armed with strong, dentiform projections, somewhat different in shape on the two mandibles, and in recent specimens of a vivid reddish-brown colour. The molar prominence is well defined, and has a rather extensive fluted surface. The palp (Pl. XII. fig. 11; Pl. XIII. fig. 10; Pl. XV. figs. 5, 15) scarcely exceeds the body of the mandible in length, and presents a somewhat deviating form in the different species. It consists, as usual, of three joints, of which the median is the largest, and is furnished with a moderate number of ciliated bristles, those on the last joint sometimes assuming the character of spines.

The first pair of maxillæ (Pl. XII. fig. 12; Pl. XIII. fig. 11; Pl. XV. figs. 6, 16) exhibit a somewhat different form from that observed in the other families of Schizopoda, being furnished with both a well developed palp and an exognath. The basal part is divided into two imperfectly defined segments, both of which project inward as well marked masticatory lobes. Of these lobes, the outer one is by far the stronger, and abruptly truncate at the end, which is furnished with a row of strong spines as well as a series of delicate bristles. The inner or basal lobe is more decidedly membranous in consistence, and somewhat linguiform, fringed along the anterior margin and at the rounded tip with a row of strong setæ, diminishing in length outwards. The palp, issuing from the distal segment of the basal part, and directed forward, consists of a single lamelliform joint, beset along the inner edge and tip with a double row of strong, ciliated bristles. Finally, the exognath forms a rather large but very thin and pellucid plate of an oval, or rather elliptical form, affixed to the outer side of the proximal segment of the basal part, and fringed at the rounded anterior end with a few short bristles.

The second pair of maxillæ (Pl. XII. fig. 13; Pl. XIII. fig. 12; Pl. XV. figs. 7, 17) also differ considerably in their general appearance from what is observed in other Schizopods. Both of the masticatory lobes are very short and broad, and proceed directly inward at right angles. They are slightly cleft in the middle, forming together four densely setiferous lobes. The palp, as in the first pair, consists of only a single rather large, lamelliform, joint, issuing from the end of the basal part and beset with bristles.

more especially along the inner edge. The exognath, too, is very small, forming simply a slight lamellar expansion of the outer edge of the basal part, and fringed with a row of short, densely ciliated, bristles. The proximal portion of the basal part forms a thick muscular segment, with the outer edge somewhat curved, and in some species furnished with a few bristles of a similar appearance to those affixed on the exognath.

The maxillipeds (Pl. XII. fig. 14) are quite pediform in structure, and only to a very slight extent differ from the succeeding true legs; hence they have generally been described by earlier authors as the first pair of legs. They consist of seven distinctly defined joints, of which the two proximal correspond to the basal part of the maxillæ, whilst the others represent the palp. The first, or coxal, joint projects inwards into a linguiform setose lobe (masticatory lobe), and in addition to this bears on its external surface a very small, simple epipodite, corresponding, as regards location, to the gills on the true legs. The second, or basal, joint is rather broad and compressed, exhibiting, on the outer side, a distinctly developed natatory branch (exopodite) of precisely the same appearance as the exopods on the legs. The ischial joint is somewhat broad, but gradually tapers towards the apex. The meral joint is much more elongate and slender, and forms, in conjunction with the carpal joint, a rather mobile articulation, the outer part of the maxilliped being generally, as in the legs, recurved almost at right angles to the remaining part. The propodal joint is somewhat larger than the carpal, without, however, attaining to anything like the length of the meral joint, and exhibits a linear form, precisely as in these joints. The terminal joint, finally, does not differ essentially from the preceding joints, save that it is a trifle shorter; it has, too, a row of short simple bristles (see fig. 15) along its inner edge, besides two or three longer ones. All the preceding joints are fringed along the inner edge, with a double series of delicate bristles, those of the inner row being very long and beset on both edges with small and somewhat widely placed hairs. On the ischial and basal joints these bristles become shorter and more numerous, assuming an almost spiniform character.

The first pair of legs (fig. 16) exhibit a very similar structure to that of the maxillipeds. They are, however, a little longer, and have the terminal joint (fig. 17) somewhat dilated and compressed. Each leg is also furnished at the inner edge with a row of peculiar curved spines, densely crowded together, as well as a series of short ciliated bristles. The inner lobe of the coxal joint is much swollen, and contains within a well developed luminous globule. The epipod, too, has assumed the character of a true gill. The exopod in this and the succeeding pair consists, as does the exopodite of the maxillipeds, of a muscular basal portion, and a lanceolate, compressed terminal part, fringed with strong natatory setæ; the articulation between the two parts is very oblique, the basal portion jutting out exteriorly at an acute angle.

The second pair of legs (fig. 18) are a trifle longer than the first pair, and only differ

from these, in the coxal joint wanting the luminous globule, and in the terminal joint being simply linear, and furnished with similar bristles to those on the preceding joints.

The three succeeding pairs of legs successively diminish in length, but exhibit otherwise precisely the same structure as the second pair. The last of these pairs, or the fifth in the series (fig. 19), has the joints somewhat more slender, and generally so bent that the terminal part, when the legs are extended, curves in an opposite direction. The gills attached to these legs are much more complex in structure than is the case with those on the preceding pairs.

Of the two last pairs of legs no trace can be detected exteriorly. Only on dissecting the animal and separating the two posterior pairs of gills (see Pl. XI. figs. 9, 11) does a minute non-articulate stem, apparently the rudiment of the leg, become perceptible, affixed to the inner side of each gill. This stem (fig. 12) is provided with a few simple bristles, and would seem to represent the endopod rather than the exopod.

The gills (see Pl. XI. fig. 5) are true "podobranchiæ," being attached to the outer side of the coxal joints of the legs, and thus, apparently, representing the modified epipods. There are seven pairs, wholly uncovered, as stated above, by the carapace, projecting at some distance beneath its inferior margin, and arranged in a dense series along each side of the trunk, partly overlapping each other posteriorly. They continue increasing in size posteriorly, and the last pair are very much larger than any of the others, and partly project along the sides of the first caudal segment. As to their structure, the four anterior pairs (see Pl. XII. figs. 16, 18, 20, 21) are much simpler than the three posterior, consisting merely of an inferiorly and anteriorly curving stem, from which issues posteriorly a regular series of slender, digitiform, or filiform appendages, diminishing gradually in length towards the apex, which appears more or less curled up. These appendages, representing the true gill elements, exhibit internally, in spirit specimens, a fairly regular double series of small globular corpuscles (fig. 22), which, apparently, are blood-cells, arranged according to the centrifugal and centripetal course they take through the appendages during life. The fifth and sixth pairs of gills (Pl. XI. fig. 9; Pl. XII. fig. 19) are divided into three branches, the two outer of which exhibit precisely the same structure as each of the anterior gills, while the inner branch is distinctly bipinnate or furnished with a double row of gill appendages. This branch, too, being the largest, is, as in the Lophogastridæ, bent in beneath the trunk, meeting the corresponding branch on the opposite side in the median line. Finally, the last pair of gills (Pl. XI. fig. 11) is far more complex in structure than any of the others, the outer branch being very large, and more or less richly arborescent: or it may send off numerous secondary branches, each of which presents a similar structure to that of the anterior gills.

In what manner the ova, immediately after being discharged from the ovaries, are carried by the females of this genus, I am unable to state, none of the specimens examined having been furnished with external egg-bags.

The caudal limbs (Pl. XII. fig. 24) are powerfully developed in both sexes, and represent true swimming organs. The basal part is somewhat adpressed and very muscular. The terminal branches are shorter than the basal part, and exhibit the form of lanceolate plates, fringed with strong natatory setæ. The inner plate (Pl. XII. fig. 25) is rather smaller than the outer, and exhibits, as in most Caridea, a slender secondary lobe attached to the inner edge, and having at the tip a number of small curled spines (cincinnulæ). In the male, this branch on the two anterior pairs is peculiarly modified, to serve as a copulatory organ (see Pl. XI. fig. 4). Especially on the first pair, this plate (Pl. XII. fig. 28; Pl. XIII. figs. 3, 13; Pl. XIV. fig. 7; Pl. XV. fig. 22; Pl. XVI. figs. 6, 14, 20) presents a very complex structure, consisting of two principal portions, the outer lamellar, and setiferous at the tip, and exhibiting on the posterior face a rounded projecting lobe, doubled over the plate; whereas the inner juts out into several strongly chitinised processes of different forms, some assuming the shape of strong hooks or pincers. This portion, too, is generally folded over the other in such a manner as to render it a matter of some difficulty to spread out the whole plate in the same plane, with a view of obtaining a correct idea of its structure. Of the two portions described above, the outer only is found to correspond with the female plate, having likewise affixed to it the secondary lobe mentioned above, whereas the inner portion is quite peculiar to the male, since it constitutes another enormously developed lobe, extending above the former from the inner edge of the principal plate. Also on the second pair of caudal limbs, the inner plate in the male (see Pl. XII. fig. 29; Pl. XIII. figs. 4, 14; Pl. XIV. fig. 8; Pl. XV. figs. 2, 3; Pl. XVI. figs. 7, 15, 21) exhibits a somewhat diverging appearance; but here it would seem that the secondary lobe itself, which is common to both sexes, becomes peculiarly modified, since it juts out at the apex into several twisted lobules, generally reaching more or less beyond the tip of the principal plate; the cincinnulæ occur on a slight rounded prominence at the outer side of the lobe. As to the function of these remarkable appendages in the male, there can, I think, be little doubt of their serving to seize the spermatophores and place them on the sexual openings of the female. The first pair are unquestionably most effective for this purpose, whilst the second pair perhaps perform merely a coadjutory function.

The telson (Pl. XII. fig. 27) in all the species of this genus, as well as in the other known Euphausiidæ, exhibits a very similar appearance, being exceedingly slender and tapering to an acute point. On the upper face two pairs of small denticles generally occur, and on the lower face, at some distance from the apex, two very large spiniform appendices are affixed in close proximity, slightly diverging and generally reaching far beyond the tip of the telson. At the base of the telson, and likewise on the lower side, is seen the anal opening, in the form of a longitudinal fissure.

The uropoda (*ibid.*), too, only exhibit slight structural differences in the several forms of the Euphausiidæ. The basal part is rather short and thick, jutting out

externally as a small dentiform projection, and fringed at the outer edge with a row of ciliated bristles. Both terminal plates are very slender, the outer, however, being somewhat broader than the inner, and of an oblong-linear form, with the outer edge naked and straight, and terminating as a very small dentiform process, the apex narrowly truncate, and, in common with the whole of the inner edge, having a row of long, ciliated bristles. The inner plate is exceedingly narrow, conically tapered, and fringed throughout with similar bristles. The length of the plates with respect to each other, as also to the telson, varies somewhat in the different species, thus affording a comparatively good specific criterion.

Luminous Globules.—These peculiar organs, for which I would suggest the above designation, have not escaped the observation of earlier zoologists, and in part have even been closely examined and described, most accurately by Professor Claus.[1] In living examples they are very conspicuous, and also in spirit-preserved specimens they admit of being readily detected on dissection. The view generally favoured regarding the function of these organs is, as is well known, that in some way they are subservient to sight, whence they have been named by most authors "accessory eyes." I have carefully examined these organs both in spirit specimens and in the living animal, and have been led to form a very different opinion, conceiving them to have nothing whatever to do with sight, but merely representing highly differentiated luminous organs. The reasons on which I base such an assumption will be set forth in the sequel. I shall first describe the organs under consideration as they occur in the genus *Euphausia*.

In all the species of this genus, as also in most other Euphausiidæ, they appear as small globules, very conspicuous in the living animal by reason of their beautiful red pigment and glistening lustre, and are symmetrically arranged both on the anterior and the posterior divisions of the body. On the trunk are observed (see Pl. XI. figs. 1, 2) two pairs of such globules, the one situated within the coxal joint of the first pair of legs (see Pl. XII. fig. 16), the other within a corresponding dilatation issuing from the base of the penultimate pair of gills (see Pl. XI. fig. 9). On the tail they occur along the ventral face, in the median line, between the bases of the pleopoda, each of the four anterior segments having a single globule. In addition to the above mentioned globules may be observed, as stated above, within the pedicle of the eyes, an organ of somewhat similar appearance, though less completely developed (see figs. 7, 8). With the exception of this last organ, all the others would seem to exhibit precisely the same structure. Those most easy to examine without dissection are the hindmost pair on the trunk (Pl. XI. fig. 10), as they lie in a position altogether external, immediately beneath the inferior margin of the carapace. On placing the living animal under the microscope, and applying a slight pressure by means of a cover-glass, in order to arrest its movements, these organs admit of being examined through a comparatively powerful

[1] Ueber einige Schizopoden und niedere Malacostraken Messina's, *Zeitschr. f. wiss. Zool.*, Bd. xiii. pp. 446, 447, 1863.

magnifier, without any further preparation. In spirit specimens, somewhat greater difficulty attends the research, since the transparency of the integuments, as also that of the organ itself, is considerably diminished by the action of the alcohol.

The organs, when isolated (see Pl. XII. fig. 26), are found to consist of perfectly globular bodies, with a very complicated structure, bearing, in some particulars, great resemblance to that of the eyes in vertebrates. A rather thick and elastic cuticle forms the outer envelope of the organ, which, moreover, in fresh specimens is coated with a beautiful red pigment in its posterior half, whereas the front portion remains quite pellucid. On closer examination, these two portions are found to fit as it were into each other, without being actually connate, and on dissecting alcoholic specimens, the two hemispheres will even readily separate from each other. At the junction, a glistening ring may be seen internally, encompassing in the middle a highly refractive lenticular corpuscle. The posterior hemisphere is filled up with cellular matter, in the midst of which lies embedded a flabelliform bunch of exceedingly delicate fibres, exhibiting in fresh specimens a most beautiful iridescent lustre. To the equatorial zone of the organ, moreover, two or three thin muscles are attached, admitting, to a certain extent, of its being rolled to and fro.

The above described parts are, it is true, of such a nature as might readily lead one to assume that these organs are highly developed eyes. The lenticular corpuscle in particular presents, both as regards its structure and its position, a striking resemblance to a true eye-lens. The glistening ring too that surrounds it might easily be taken for a kind of iris. The diaphanous front of the organ likewise and the red pigment coating of the hinder part, as also the arrangement of the muscles for moving the whole organ, would seem to favour such an assumption.

Notwithstanding this great resemblance to visual organs, researches conducted with the living animal have convinced me that none of these organs are coadjutory to sight, but that they all together constitute a very complicated and peculiarly developed luminous or phosphorescent apparatus.

It has already been stated by W. Thompson that these Crustacea are highly luminous at night, and for this reason he suggested for them the generic name "*Noctiluca*." I myself have several times had opportunities of testing the accuracy of this statement as regards the Norwegian species of the family, and have convinced myself that the animal is able, by varying the movements of the organs, to increase or diminish the light at will. The chief light-producing matter I have found to be the fibrous fascicle lying in the centre of the globular corpuscle. Even if the organ be crushed, and this fascicle extracted, it still continues to give forth a comparatively strong phosphorescent light when seen in the dark. The lenticular corpuscle placed just in front of this fibrous matter may, I conceive, act as a condenser, producing a bright flash of light, the direction of which admits of being changed at the will of the animal, by simply rolling the organ by means of its muscular apparatus. The pigment-coating of the hinder portion, and

the diaphanous condition of the front part, may likewise be easily explained as subservient to such a function.

That the organs in question cannot, as formerly held, be eyes, may be inferred from several facts:—1. The nerve that penetrates the organs, or at least those belonging to the trunk, is very thin, and does not give rise to any special (retinal) expansion. 2. The structure of the hinder part of the globule is wholly different from that observed in true eyes, being completely filled with a cellular mass, in the centre of which the fibrous corpuscle lies embedded, and having its pigment-coating not internal but external. 3. The arrangement of the organs belonging to the tail is such, assuming the organs to be eyes, as by no means to admit of a good visual impression, the constant motion of the pleopoda approximating the organs at very short intervals, whereas the effect of phosphorescence may for that very reason be materially augmented, giving to the light a glittering or tremulous lustre. 4. Finally, I have found, as stated above, a similar organ embedded in the pedicle of the true eyes themselves, and this organ, being immobile, also entirely lacks the front hemisphere with its lenticular corpuscle, whereas the hinder one in every respect agrees with the posterior part of the other organs, exhibiting in the centre a large bunch of phosphorescent fibres, and externally a coating of red pigment (see Pl. XI. fig. 8). It is certainly far from probable that any one examining the last of these organs would venture to assign it the function of sight; and, indeed, Professor Claus, who has recorded and figured the organ in the larvæ—in the adult animal it would seem to have totally escaped his attention—has nothing whatever to state respecting its probable function. Meanwhile, the organ undoubtedly bears the closest relation to the above described globules, both in regard to structure and function, the light it produces being, in fact, very intense, though comparatively more steady, than is that from the other movable organs. Since the eye-pedicles, however, are themselves movable, the animal may also, to a certain extent, be able to vary the effect of these organs.[1]

Nervous System (see Pl. XII. fig. 30).—The nervous cord in the Euphausiidæ exhibits certain rather striking peculiarities as compared with that in other Schizopods. Thus, the number of separate ganglia belonging to the anterior division of the body is greater than in any other known form of podophthalmous Crustaceans, since, exclusive of the cerebral or supra-œsophageal ganglion, no less than eleven ganglia occur, all of which, however, lie embedded, as it were, within a common envelope of connective tissue. The most anterior only of these ganglia, belonging apparently to the mandibular segment, would seem to present all the features of a simple nervous dilatation, whereas the succeeding ones consist of two well-marked lateral halves, and are connected by double and somewhat distant commissures. Each of the two pairs of maxillæ are innervated by their separate ganglion, whereas these ganglia in most other Crustacea are, as is well-known, united and consolidated with the mandibular ganglion into one nervous mass. The two posterior ganglia

[1] See Narr. Chall. Exp., vol. i. p. 743, 1885.

of the trunk lie close together, at a considerable distance from the preceding ganglia, the commissures being rather long, and also less distant, than are those connecting the preceding ganglia.

The supra-œsophageal or cerebral ganglion is rather large, and exhibits a somewhat elliptical form, its transverse diameter being the larger. On its upper surface, close to the anterior margin, is seen embedded the ocellus, or larval eye; and from each side proceed the greatly developed optic nerves, forming in the interior of the eye-pedicles a large ganglionic tumescence, within which lies immersed the previously mentioned luminous organ. Moreover, from the inferior face of the ganglion originate two pairs of strong nervous trunks, each of which exhibits at the base a conspicuous ganglionic swelling; the one pair passes anteriorly in a direct line to the antennulæ, the other curves out exteriorly, entering the basal portion of the antennæ. The commissures connecting the cerebral ganglion with the first ventral are exceedingly long and at a wide distance apart, encompassing the œsophagus, and are connected together immediately behind it by a thin transverse commissure; each, too, sends off before its union with the mandibular ganglion a slender nerve, which passes apparently to the stomach.

The caudal ganglia are by comparison exceedingly large, slightly exceeding even those of the trunk, and are connected by very long commissures lying close together. As is the case in *Gnathophausia*, and perhaps in most of the Podophthalmia, a pair of slender nerves, exclusive of the strong nerve-trunks originating from the ganglia themselves, extend from the commissures, apparently innervating the musculature of the tail. Furthermore, from the last caudal ganglion originate numerous nerves, most of which enter the caudal fan, innervating its various parts.

Digestive System (see Pl. XI. fig. 5).—The œsophagus is very short, ascending perpendicularly to the stomach. Its walls would seem to be strongly chitinised, and are continued into the inner (upper) coating of the anterior and posterior lips. The stomach (*st*) lying, as usual, within the most anterior part of the visceral cavity in front of the cervical groove, exhibits on the whole a similar structure to that in the Mysidæ, being armed, more particularly at the ventral face, with numerous chitinous ridges, beset with delicate bristles. Several strong muscles are attached to the stomach, by means of which its several parts admit of being moved one against the other, thus crushing or bruising the food before it is forced into the intestine. The pyloric section of the stomach has above two small, incurving cæca, and to its inferiorly protruding part is appended the liver (*l*), in the form of two rather large ovoid masses, which are partly united, and consist of a prodigious number of minute cæca, crowded together. The intestine (*i*) has the form of an exceedingly narrow tube passing through the posterior part of the trunk and the whole of the tail, and terminating in a short rectum that opens at the base of the telson through a longitudinal fissure. In the living animal the whole

intestine exhibits very energetic and uninterrupted peristaltic and antiperistaltic movements, giving it a peculiar moniliform aspect.

Circulatory System.—The heart (Pl. XI. figs. 5, 6, *h*) is placed immediately beneath the posterior part of the carapace, and exhibits a structure very similar to that observed in the higher Podophthalmia, being rather concentrated, of a somewhat short polygonal form, and furnished with six pairs of fissiform venous openings, for the entrance of the blood accumulated in the pericardial sinus. Moreover, the number and arrangement of the principal arterial trunks would seem to agree perfectly with that observed in higher Crustaceans.

Generative System.—The ovaria (Pl. XI. fig. 5, *ov*) form two partly connate masses of a somewhat irregular ovoid form, placed beneath the heart, and projecting anteriorly to a greater or less extent above the liver. They are found to contain numerous, perfectly translucent egg-cells which vary in size, and from their lower face give origin to two rather strong oviducts, extending straight downwards and opening close together on the sternal part of the antepenultimate segment of the trunk. Here, too, may often be seen affixed two pedunculated vesicles, the spermatophores (Pl. XIII. fig. 7).

The testes are combined as a comparatively small bunch of rounded, anteriorly pointing cæca, lying in front of the heart, immediately beneath the carapace. The vasa deferentia are very long and flexuouse, extending posteriorly into the last segment of the trunk, where they curve abruptly downward, and form a considerable dilatation (see Pl. XI. fig. 4), within which may be observed the developing spermatophore. The latter exhibits in the present genus (see Pl. XII. fig. 23) a somewhat lageniform appearance, being gradually dilated toward the apex, and possessing a highly chitinised envelop. The spermatozoids constitute simple, elliptical, nucleate cells.

Habitat and Distribution.—All the known species of this genus are truly pelagic, the animals being often found in great profusion swarming at the surface of the sea, especially at night; but in all probability they descend at times to considerable depths, as is alleged to be the case with most other pelagic animals.

The genus would seem to be distributed throughout most parts of the ocean, except perhaps the Arctic region, where it is represented by a closely allied generic type, *Boreophausia*, G. O. Sars.

The following synopsis of the species may be here appended :—

- Frontal part of carapace
  - acutely produced. Eyes very small. Third caudal segment
    - rather large, pyriform. Inferior margin of carapace armed with
      - two denticles, . *E. pellucida*, Dana.
      - a single denticle, *E. similis*, G. O. Sars.
    - smooth, not produced, . . *E. gracilis*, Dana.
    - produced to an acute posteriorly curving lapped, . . *E. gibba*, G. O. Sars.
  - very slightly produced. Inferior margin of carapace
    - smooth, ... *E. superba*, Dana.
    - armed with a single denticle placed
      - anteriorly to the middle, . *E. murrayi*, G. O. Sars.
      - in the middle. Third caudal segment
        - smooth, . . *E. splendens*, Dana.
        - produced to a posteriorly pointing spine, . *E. macronata*, G. O. Sars.
  - produced to a strong rostral projection, and armed with distinct supra-orbital spines. Caudal segments partly spinous, . . *E. spinifera*, G. O. Sars.
  - projecting as a broad plate
    - triangularly pointed, ... *E. antarctica*, G. O. Sars.
    - truncate at the apex, ... *E. latifrons*, G. O. Sars.

14. *Euphausia pellucida*, Dana (Pls. XI., XII.).

Euphausia pellucida, Dana, United States Expl. Exped., vol. xiii., Crustacea, p. 641, pl. xlii. fig. 4, *a–m*.

Euphausia mülleri, Claus, Zeitschr. f. wiss. Zool., Bd. xiii. p. 432, pl. xxviii. figs. 29–31, pl. xxix.

Thysanopoda bidentata, G. O. Sars, Oversigt af Norges Crustaceer, Bd. i. p. 50, pl. i. figs. 11–14.

Euphausia pellucida, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 13.

Specific Characters.—Carapace with two lateral denticles on either side, frontal part produced and acutely pointed. Caudal segments smooth, epimera rather large and of uniform appearance. Last segment longer than the preceding; preanal spine tridentate. Eyes of moderate size, pyriform. Basal joint of antennulæ with an erect leaflet above, usually divided into two acuminate lappets. Antennal scale oblong-ovate, obtusely truncate at apex, outer corner unarmed; basal spine very large, and denticulate at inner edge. Terminal joint of second pair of maxillæ short and broad, with a row of small teeth anteriorly. Telson elongate; subapical spines very large, and finely denticulate at inner edge. Inner plate of uropoda longer than outer. Usual length of adult female 10 to 15 mm.

Remarks.—This would seem to be by far the commonest of all the Challenger species

of *Euphausia*, and, as it cannot reasonably be supposed to have escaped the attention of Dana, I have deemed it advisable to refer the animal to one of the four species described by that author. Of these, the species *Euphausia pellucida* is the one that would seem to agree best with the present form, for which, accordingly, I propose to retain the specific appellation first suggested by Dana. That the *Euphausia mülleri* of Claus is identical with the form here treated of is undeniable, and the form described by myself as *Thysanopoda bidentata* unquestionably also belongs to the same species.

Description.—The usual length of the adult female is 10 to 15 mm., that of the male somewhat less; but there are a few specimens in the collection that reach a length of 17 mm.

The form of the body (see Pl. XI. figs. 1, 2, 4) is rather slender, and, as usual, somewhat compressed throughout, with the tail about twice the length of the anterior division.

The carapace has the anterior part distinctly keeled above, and jutting forth as a sharp-pointed rostral projection, reaching to about the middle of the basal joint of the antennulæ. Posteriorly it exhibits an almost rectangular emargination, the lateral angles of which are produced into narrow sinuses, marking sharply off above the lateral wings of the carapace, which are broadly rounded (see also figs. 5, 6). Immediately superior to the lower margins on either side occur two small anteriorly pointing denticles, the posterior of which is placed above the point of insertion of the fourth pair of legs, the anterior above that of the maxillipeds. The antero-lateral corners of the carapace constitute at the side of the basal part of the antennæ a very slight dentiform projection, apparently corresponding to the antennal spine in other Podophthalmia.

The caudal segments are powerfully developed, and quite smooth above, diminishing somewhat both in height and breadth posteriorly. The epimera are rather large and laminar, projecting considerably beyond the ventral face, and covering at the sides the bases of the pleopoda. They all exhibit a comparatively uniform appearance, being somewhat angular in shape, and pointing obliquely backward. The last segment is a trifle more elongate than any of the preceding, and much narrower, without any trace of epimera, but armed at the end, beneath, with a compressed, tridentate, pectiniform spine (fig. 3), placed immediately in front of the anal orifice.

The eyes (fig. 7) are of moderate size, and pyriform, with the cornea rather expanded, and projecting on either side (see fig. 2).

The antennular peduncle (Pl. XII. figs. 1, 2) is about half as long as the carapace, and nearly cylindrical in form; it is more particularly distinguished by the basal joint, having at the end above a conspicuous erect leaflet or membranous lobe. In most of the specimens this lobe is divided into two acuminate lappets (fig. 3); but in some specimens, though differing in no other respect from the typical form, these lappets are much more numerous, forming a dense fringe along the free edge of the leaflet (fig. 4).

The antennal scale (fig. 5), but very slightly projecting beyond the second joint of the antennular peduncle, exhibits an oblong-ovate form, its greatest breadth equalling about one-third of the length. The apex is abruptly truncate, with the outer corner unarmed and well-nigh forming a right angle. The basal spine, projecting beneath the scale, is very strong, and extends far beyond half its length; it is armed at the inner edge with a row of fine denticles. The basal part of the flagellum reaches to the apex of the scale, and is rather strong, with the two outer joints uniform in size.

The mandibular palp (see figs. 9, 11) scarcely attains the length of the mandible itself, and is specially distinguished by the middle joint being furnished (exclusive of the usual marginal setæ) with numerous short, spiniform bristles, arranged partly in a double series along the inner side.

The first pair of maxillæ (fig. 12) have the exognath comparatively small, and of an oval form.

The second pair of maxillæ (fig. 13) are distinguished more particularly by the short and broad form of the terminal joint, which, moreover, exhibits anteriorly (apart from the usual setæ) a row of diminutive spiniform bristles similar to those on the mandibular palp.

The maxillipeds (figs. 14, 15), the legs (figs. 16–19; Pl. XI. fig. 12), and the gills (Pl. XII. figs. 19–22; Pl. XI. figs. 9, 11) exhibit the structure characteristic of the genus.

The copulatory appendages projecting from the inner plate of the two first pairs of pleopoda in the male (see Pl. XI. fig. 4) are very powerfully developed. Those on the anterior pair (Pl. XII. fig. 28) jut out into three strong processes, the two outer of which are highly chitinised, and bent in the form of hooks; one of them has the apex simple-acuminate, whereas the other expands at the tip into a serrate oblong plate. The appendages to the second pair of pleopoda (fig. 29) branch out into two soft, irregularly lobular processes, reaching far beyond the tip of the principal plate.

The telson (see fig. 27) is very slender and elongate, almost equalling in length the two posterior segments taken together, and has the apex produced to a lanceolate point. The subapical spines are strongly developed, reaching far beyond the tip of the telson, and diverging from each side; they are also finely denticulate along their inner edge. Moreover, on the upper face, anterior to the point of insertion of the subapical spines, occur two pairs of minute denticles, placed at some distance from each other.

The uropoda (*ibid.*) do not nearly attain the tip of the telson, and have the inner plate rather longer than the outer, but very much narrower.

Colour.—Dana states that this form, in a living state, is quite pellucid, without any conspicuous pigmentation; and hence he suggested the specific name "*pellucida*." The solitary specimen also, taken by myself off the Norwegian coast, and at first described as *Thysanopoda bidentata*, exhibited a perfect transparency throughout the whole body.

Habitat.—All the specimens of this species collected on the Challenger Expedition were caught in the tow-net at the surface of the sea, in many different parts of the ocean. As regards the localities, the date alone was, in most cases, recorded on the labels, the tow-net having been on many occasions resorted to when neither dredging nor trawling was carried on. Hence, the localities for this and other species of Euphausiidæ cannot in every case be referred to any of the actual Station numbers. To faciliate this question, I have made an attempt in the following list to specify the tracts of the ocean where the specimens were caught, by comparing the dates recorded with the Stations marked off on the map accompanying the list of Observing Stations prepared for the use of the naturalists engaged in furnishing an account of the voyage.

Date.	Locality.
June 18, 19, 1873.	North Atlantic, between the Azores and Bermuda.
August 16, 1873.	Tropical Atlantic, off African coast.
October 5, 1873.	South Atlantic, south-east of Rio de Janeiro.
December 19, 1873.	South of Cape of Good Hope.
August 11, 12, 1874.	Pacific, off Kandavu, Fiji Islands.
August 25, 26, 1874.	West Pacific, Api to Cape York.
(No date recorded.)	Australian Sea, Sidney to Wellington.
February 6, 1875.	Celebes Sea, off Mindanao, Philippine Islands.
February 1875.	North of New Guinea.
March 13, 1875.	North of New Guinea.
April 3, 1875.	North Pacific, south of Japan.
June 23, 1875.	North Pacific, east of Japan.
July 4, 1875.	North Pacific, further east.
July 1875.	North Pacific, Japan to Honolulu.
August and September 1875.	Tropical Pacific, south of the Sandwich Islands.
August 24, 1875.	Tropical Pacific, south of the Sandwich Islands.
October 18, 1875.	South Pacific, about midway between New Zealand and Chili.
October 21, 1875.	South Pacific, about midway between New Zealand and Chili.
April 13, 1876.	Tropical Atlantic, off African coast.
April 26, 1876.	Tropical Atlantic, off St. Vincent, Cape Verde Islands.
April 28, 1876.	North Atlantic.

The specimens examined by Dana were collected in the Pacific, near Northern Kingsmill Islands.

Distribution.—As shown by the above stated localities, this species exhibits a truly astonishing geographical range, having been met with in almost every tract of the ocean traversed by the Challenger; the North and South Atlantic, the Australian Sea, Celebes Sea, and throughout the Pacific, from lat. 40° S. to lat. 40° N. It has, moreover, been observed by Claus in the Mediterranean (*Euphausia müllerí*), and a single specimen of the same species was collected by myself off the Norwegian coast (Magerö) in lat. 63° 28′ N.

15. *Euphausia similis*, G. O. Sars (Pl. XIII. figs. 1–6).

Euphausia similis, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 14.

Specific Characters.—Form of body somewhat more slender than in the preceding species. Carapace with only a single, small, lateral denticle at the middle of the inferior margin; rostral projection rather produced, and very acute. Caudal segments smooth above; epimera of fourth and fifth segments small, and slightly emarginate inferiorly. Last segment very elongate; preanal spine diminutive, and simple. Eyes pyriform. Antennular peduncle without any distinct dorsal leaflet. Antennal scale rather broad, ovate, obliquely rounded at the apex, outer corner unarmed. Subapical spines of telson much smaller than in *Euphausia pellucida*, and quite smooth. Inner plate of uropoda shorter than outer. Length reaching 30 mm.

Remarks.—This species is very nearly related to *Euphausia pellucida*, but attains almost twice the size of that form. Moreover, the animal may easily be recognised by the rostrum being considerably more produced, by having but a single lateral denticle on the carapace, by the much shorter and perfectly smooth subapical spines of the telson, and finally, too, by a somewhat different relation in length between the terminal plates of the uropoda, as also by the simple structure of the preanal spine.

Description.—Of the present species the collection contains but one specimen, an adult male. It measures 30 mm., and hence has about double the length of the specimens belonging to the preceding species.

The general form of the body (see Pl. XIII. fig. 1) approximates to that of *Euphausia pellucida*, though perhaps a trifle more slender.

The carapace has the anterior part but very slightly keeled above, and it runs out as a comparatively long and very acute rostral projection, reaching beyond the middle of the basal joint of the antennulæ. On the inferior margin occurs but a single small denticle, placed a little in front of the middle, or somewhat behind the base of the first pair of legs.

The caudal segments are, as in the preceding species, smooth above, and taper out gradually backward. The three anterior pairs of epimera present the usual form, and project not inconsiderably, whereas the two posterior pairs exhibit a somewhat different aspect, projecting, as they do, a trifle less, and having the lower margin slightly incurved, as also the posterior lobe narrowly produced. The last segment is very elongate, and the preanal spine exceedingly small and quite simple, claw-shaped.

The eyes (see fig. 2) are rather large and pyriform, with the cornea greatly expanded.

The antennular peduncle (*ibid.*) exhibits much the same appearance as in *Euphausia pellucida*, but lacks any distinct dorsal leaflet, the basal joint forming at the extremity above only a slight, well nigh imperceptible lobe.

The antennal scale (see fig. 2) is rather broad and oval in form, with the apex obliquely rounded, and the outer angle unarmed. It projects scarcely at all beyond the second joint of the antennular peduncle.

The copulatory appendages to the two first pairs of pleopoda (figs. 3, 4) differ somewhat in their structural details from those in *Euphausia pellucida*. More especially in the first pair, the differences are at once perceptible by comparing fig. 3 of this plate with fig. 28 of Pl. XII., the hook-shaped processes having a somewhat dissimilar form in the two species.

The telson (see fig. 5) is very slender, and distinguished from that in *Euphausia pellucida* more particularly by the subapical spines being much smaller and quite smooth.

As in the preceding species, the uropoda (*ibid.*) do not attain the length of the telson; and as regards the terminal plates—contrary to the relation in *Euphausia pellucida*—the inner are appreciably shorter than the outer.

Habitat.—The above described specimen was taken with the trawl, in the South Atlantic, south-east of Buenos Ayres, having in all probability been brought up from some intermediate stratum of the sea during the hauling up.

Station 320, February 14, 1876; lat. 37° 17′ S., long. 53° 52′ W.; depth, 600 fathoms.

16. *Euphausia splendens*, Dana (Pl. XIII. figs. 7–17).

Euphausia splendens, Dana, United States Expl. Exped., vol. xiii., Crustacea, p. 642, pl. xlii. fig. 5, *a–h*.

Euphausia splendens, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 15.

Specific Characters.—Form of body somewhat more robust than in the last two species. Carapace with a single denticle about the middle of the lower margin; anterior part slightly keeled above; rostral projection remarkably short, scarcely projecting beyond the ocular segment. Caudal segments smooth above; epimera rather small and evenly rounded. Last segment longer than preceding; preanal spine simple. Eyes rather large, pyriform. Antennular peduncle without any trace of dorsal lobes, but with a fascicle of very strong curved setæ, springing from off the dorsal face of the basal joint. Antennal scale nearly as in *Euphausia pellucida*; basal spine, however, much shorter. Terminal joint of second pair of maxillæ very large, and ovate in form. Subapical spines of telson smooth. Inner plate of uropoda a little shorter than outer. Length reaching 18 mm.

Remarks.—As the descriptions of Dana are anything but satisfactory, it is somewhat difficult to decide with absolute certainty whether this form be in fact identical

with the *Euphausia splendens* of that author, or belong to some other allied species. Meanwhile, assuming the species so designated by Dana to be almost certainly represented in the rich collection of the Challenger Euphausiidæ, I hold this form to be the one most properly referable to that species. From both the preceding species the present form may be readily distinguished by its robust body, the very short rostral projection, and the strong, curving setæ that spring from the basal joint of the antennulæ.

Description.—The length of the largest specimen reaches about 18 mm., and the species attains accordingly a somewhat larger size than *Euphausia pellucida*.

The general form of the body (see Pl. XIII. fig. 7) would, on the whole, appear to be somewhat shorter and more thickset than in the two preceding species, and this feature, too, is obvious from the figure given by Dana, at least as compared with that of *Euphausia pellucida*.

The carapace, as in *Euphausia similis*, exhibits on either side a single lateral denticle about the middle of the lower margin, or rather just above the point of insertion of the second pair of true legs. Its anterior part has above a well-marked keel, and the frontal margin forms in the middle a very slight rostral projection, or rather an acute angle, scarcely projecting beyond the ocular segment.

The caudal segments are smooth above and furnished with rather small evenly rounded epimera. The last segment is appreciably longer than any of the preceding, and has the preanal spine (fig. 17), as in *Euphausia similis*, quite simple or unguiform, though somewhat stronger than in that species.

The eyes (see fig. 15) are very large and projecting, pyriform, with the cornea much expanded.

The antennular peduncle (fig. 8) is more particularly distinguished by the total absence of any dorsal leaflet or lobe, whereas a bunch of strong, curving bristles is seen to spring from the dorsal face of the basal joint.

The antennal scale (fig. 9) agrees in its form comparatively well with that in *Euphausia pellucida*, though perhaps a trifle more elongate. The basal spine, as in that species, is distinctly denticulate, but very much smaller.

The mandibular palp (fig. 10) exhibits none of the short spiniform bristles peculiar to *Euphausia pellucida*.

The first pair of maxillæ (fig. 11) have the exognath relatively larger, and more oblong in form.

The second pair of maxillæ (fig. 12) are chiefly distinguished by the large size and ovoid form of the terminal joint.

The copulatory appendages of the two first pairs of pleopoda in the male (see figs. 13, 14) exhibit on the whole a structure considerably approximating to that in *Euphausia similis*. Still, however, a few well-marked differences may be found, more especially in

the form of the three hook-shaped processes on the appendages of the first pair, as shown in the respective figures (compare figs. 3 and 13).

The telson and uropoda (fig. 16) would not seem to differ essentially from those parts in *Euphausia similis*.

Colour.—According to Dana, this species, in a living state, is more or less tinged with red or purple, especially along the ventral face of the body.

Habitat.—The specimens in the collection were taken at the surface of the sea in the following localities, as shown in the table :—

Date.	Locality.
December 17, 18, 1873.	Off Cape of Good Hope.
October 21, 1875.	South Pacific, about midway between New Zealand and Chili.
January 21, 1876.	South Atlantic, Cape Virgins to Falkland Islands.
February 11, 1876.	South Atlantic, Falkland to Buenos Ayres.

The specimens examined by Dana were collected in the tropical region of the Atlantic (lat. 2° N.).

Distribution.—The distribution of the present species, as yet known, would accordingly seem to be chiefly restricted to the southern parts of the Atlantic and Pacific Oceans.

17. *Euphausia murrayi*, G. O. Sars (Pl. XIV. figs. 1–4).

Euphausia murrayi, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 16.

Specific Characters.—Form of body somewhat more slender than in *Euphausia splendens*. Carapace rather elongate, with a single lateral denticle, placed in front of the middle of the inferior margin; anterior part very slightly keeled above; rostral projection short; frontal margin forming on either side, above the eyes, an obtuse angle. Caudal segments smooth above, with rather deep epimera, the posterior pair triangular, produced posteriorly. Last segment not much longer than preceding; preanal spine obsolete. Eyes short and thick, claviform. Antennular peduncle provided above at the end of the basal joint with an anteriorly pointing lobe, obliquely emarginate at the tip. Antennal scale oblong, truncate at apex, denticle of outer angle very small. Gill-trunks very broad and flattened, with numerous exceedingly slender, well-nigh filiform lobules. Telson with three pairs of dorsal denticles; subapical spines smooth. Inner plate of uropoda very slightly overreaching outer. Length attaining 43 mm.

Remarks.—Next to *Euphausia superba*, this *Euphausia* is the largest in the collec-

tion, and admits of being distinguished from *Euphausia splendens*, to which form it bears a close relationship,—except in its much larger size,—by a somewhat more slender form of body, the comparatively shorter eyes, the presence of a well-marked cuticular lobe at the end of the basal joint of the antennulæ, the peculiar expanded form of the gills, and finally by the form of the posterior pair of caudal epimera.

Description.—Of this species, the collection has two specimens, the larger of which reaches a length of 43 mm. Both are females.

The form of the body (see Pl. XIV. fig. 1) would seem to be a trifle more slender than in *Euphausia splendens;* the anterior division in particular is appreciably more elongate as compared with the posterior.

The carapace, as in *Euphausia splendens*, has on either side a distinct lateral denticle, which, however, occurs somewhat in front of the middle of the lower margin. Its anterior part is very slightly keeled above, and marked off by a distinct cervical impression. The rostral projection (see fig. 2) is very short and triangular, but slightly overreaching the ocular segment, and, moreover, rather sharply defined from the frontal margin, which on either side exhibits an obtuse angle above the eyes.

The caudal segments are smooth above, and provided with rather deep, irregularly rounded epimera. Those on the penultimate segment are, however, somewhat dissimilar, being rather produced in the form of acute, triangular plates, pointing backwards and overlapping the last segment. This, too, is but very little, if at all, longer than the preceding, and does not exhibit any trace of a preanal spine.

The eyes (see fig. 2) are rather short and thick, almost clavate, and but slightly projecting on either side.

The antennular peduncle (*ibid.*) is comparatively elongate, and has a distinct cuticular lobe projecting, above, from the end of the basal joint, as also another much smaller one, exteriorly, at the end of the second joint. Both the lobes are extended horizontally, and exhibit a somewhat triangular form, the larger one is also obliquely emarginate at the tip.

The antennal scale (*ibid.*) projects a little beyond the second joint of the antennular peduncle and has a rather elongate, oblong-linear form, with the apex narrowly truncate and the denticle of the outer corner very small, though quite distinct.

The gills (fig. 3) are characterised by a somewhat unusual form of the trunk, which is greatly expanded and flattened, well-nigh semilunar, and has affixed to the outer convex edge a very considerable number of exceedingly slender, nearly filiform gill-lobules. The posterior pairs of gills (see fig. 1) are richly arborescent, exhibiting an abundance of curved secondary branches.

The telson (see fig. 4) exhibits the usual slender form, and has three pairs of small dorsal denticles. The subapical spines were broken in the larger specimen; in the smaller one they are of moderate size and quite smooth.

The uropoda (see fig. 4) reach very nearly to the tip of the telson, and have the inner plate projecting slightly beyond the outer.

Habitat.—The two specimens secured were taken at the following localities:—

Date.	Locality.
January 27, 1874.	Southern Ocean, off Kerguelen, in trawl, 96 fathoms.
February 19, 1874.	Antarctic Ocean (Station 154), near ice-barrier.

Distribution.—The distribution of the species, as yet known, would accordingly seem to be restricted to the Southern and Antarctic Oceans.

18. *Euphausia superba*, Dana (Pl. XIV. figs. 5–9).

Euphausia superba, Dana, United States Exploring Expedition, vol. xiii., Crustacea, p. 645, pl. xliii. fig. 1, *a–o*.
Euphausia superba, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 17.

Specific Characters.—Body rather compressed. Carapace narrow, without any lateral denticle; anterior part scarcely at all keeled above; rostral projection very small, and obtusely rounded. Caudal segments smooth above, with very large epimera. Last segment short, not longer than preceding; preanal spine obsolete. Eyes large, pyriform. Antennular peduncle very strong, having above, at the end of the basal joint, a small, cordiform lobe. Antennal scale comparatively short, ovate, apex obliquely rounded. Exopods of legs, as also pleopods, very powerfully developed. Gills well-nigh as in *Euphausia murrayi*. Telson with apex very slightly produced; subapical spines slender and smooth. Uropoda reaching beyond tip of telson, inner plate shorter than outer. Length attaining 48 mm.

Remarks.—There cannot, I think, be any doubt whatever as to the identity of the form treated of here with Dana's *Euphausia superba*, and, moreover, the specimen in the collection had been labelled with that name by the late Dr. v. Willemoes-Suhm. It is readily distinguished from all the preceding species, not only by its large size, but also by the very short and obtuse rostral projection, the absolute want of lateral denticles on the carapace, the remarkably thick antennular peduncles, and the powerful development both of exopods and pleopods.

Description.—The solitary specimen procured during the Expedition is an adult male, measuring 48 mm. in length.

The general form of the body (see Pl. XIV. fig. 5) is as in *Euphausia murrayi*, though comparatively more compressed.

The carapace is rather narrow, and lacks every trace of lateral denticles, and,

moreover, does the anterior part exhibits no distinct keel above. The rostral projection (fig. 6) is exceedingly short, reaching but very slightly beyond the ocular segment, and the frontal margin does not form any angle above the eyes, as in the preceding species.

The caudal segments are very powerfully developed, and, as in the preceding species, smooth above. The epimera are rather deep and irregularly rounded in form, except the posterior pair, which, as in *Euphausia murrayi*, are triangular and produced. The last segment does not exceed in length the preceding, and would seem to lack the preanal spine.

The eyes (see fig. 6) are very large and protruding, pyriform, with the cornea very much expanded.

The antennular peduncle (*ibid.*) exhibits an exceedingly robust structure, and has a well marked cordiform lobe, projecting above from the end of the basal joint.

The antennal scale (*ibid.*) is comparatively short, scarcely reaching to the end of the second joint of the antennular peduncle; it exhibits an oval form, with the apex somewhat obliquely rounded and the denticle of the outer corner very small, almost obsolete.

The gills (see fig. 5) would, on the whole, seem to agree in structure with those of *Euphausia murrayi*.

The exopods on the maxillipeds and legs, as also the pleopods, are very powerfully developed, more so than in any other known species.

The copulatory appendages to the first pair of pleopoda (fig. 7) closely resemble those in *Euphausia splendens*; still, however, some few differences in detail may be discerned. Thus, for example, the outer process and the secondary hook of the inner one are quite simple, and strongly curved, whereas these parts in *Euphausia splendens* are bidentate at the apex. The appendages of the second pair of pleopoda (fig. 8) are comparatively shorter, reaching but very little beyond the apex of the principal plate.

The telson (see fig. 9) is comparatively shorter than in the other species, with the apex very slightly produced and obtusely pointed. The subapical spines are exceedingly slender and quite smooth.

The uropoda (*ibid.*) reach somewhat beyond the tip of the telson, and have the inner plate appreciably shorter than the outer.

Colour.—According to the statements of Dana, this species, in a living state, is characterised by a very conspicuous colouring, the whole body, save the legs and gills, being tinged with a brilliant red.

Habitat.—The above described specimen was taken at the surface of the sea, along with the larger specimen of *Euphausia murrayi*, February 19, 1874, in the Antarctic Ocean, at Station 154. Dana obtained this species, too, in the Antarctic Ocean, south of Van Diemen's Land, in lat. 66° 5′ S., long. 157° E.

19. *Euphausia antarctica*, G. O. Sars (Pl. XV. figs. 1–8).

Euphausia antarctica, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 18.

Specific Characters.—Form of body rather slender, with tail less powerful in development than is generally the case. Carapace without any lateral denticle; anterior part slightly keeled above and projecting as a broad, triangular, frontal plate. Caudal segments smooth above, with remarkably small, rounded epimera. Last segment slightly exceeding in length the preceding, with a minute, simple, preanal spine. Eyes claviform. Antennular peduncle slender, without any dorsal lobe, but with the outer corner of the basal joint produced into a sharp spine. Antennal scale oblong-linear, obtusely truncate at apex, outer corner jutting out as a well marked dentiform projection. Mandibular palp remarkably slender, with terminal joint linear. Last joint of second pair of maxillæ oblong-ovate. Legs very elongate and densely setose. Telson with three pairs of dorsal denticles; subapical spines moderate in size, smooth. Uropoda much shorter than telson, inner plate slightly overreaching outer. Length 17 mm.

Remarks.—This is a rather anomalous form, and readily distinguished from all the other species by the remarkably narrow tail and very slender legs, as also by the broad triangular frontal plate and the form of the antennal scale.

Description.—All the specimens collected are females, and the largest measures about 17 mm. in length.

The form of the body (see Pl. XV. fig. 1) is rather slender, and the proportion between the anterior and posterior divisions somewhat different from that observed in most of the other species, the tail being relatively far less powerfully developed.

The carapace lacks every trace of lateral denticles, the inferior margin being quite smooth and but very slightly incurved along their anterior part. The antero-lateral angles of the carapace project considerably and are acutely angular; the frontal part (see fig. 2) protrudes over the base of the eyes as a broad horizontally extending plate of triangular form, reaching nearly to the middle of the basal joint of the antennulæ. From the base of the plate, a slight dorsal keel is seen to extend backwards along the anterior part of the carapace.

The caudal segments are smooth above and rather narrow, the epimera being comparatively very small and evenly rounded. The last segment but slightly exceeds in length the preceding, and has a very small, simple preanal spine (fig. 4), mostly hidden between the bases of the uropoda.

The eyes (see fig. 2) project considerably, but have the cornea not very much expanded, with the greatest breadth about the middle of the pedicle.

The antennular peduncle (*ibid.*) is comparatively slender, and lacks every trace of dorsal lobes, but has the outer corner of the basal joint jutting forth as a sharp, spiniform projection.

The antennal scale (see fig. 2) exhibits a form somewhat different from that in the other species, being rather elongate, oblong-linear, and projecting a little beyond the second joint of the antennular peduncle. The apex is obtusely truncate, and the outer angle juts out into a well marked, dentiform projection.

The mandibular palp (fig. 5) is very slender, its terminal joint being nearly as long as the median, but very much narrower, linear, and armed with six spiniform bristles, increasing gradually in length toward the apex.

The first pair of maxillæ (fig. 6) have the exognath very large and oval in form, but in other respects resemble those of *Euphausia splendens*.

The second pair of maxillæ (fig. 7) are more particularly distinguished by the remarkable size and oblong-ovate form of the terminal joint.

The legs are very slender and elongate, the ischial joint being much the largest, and in the fifth pair (fig. 8) exceeding in length even all the succeeding joints taken together. They are, moreover, furnished with a very dense fringe of remarkably long and delicate setæ.

The gills (see figs. 1, 8) would seem, on the whole, to agree comparatively closely in structure with those of *Euphausia pellucida*.

The telson (see fig. 3) about equals in length the two posterior segments taken together, exhibiting a somewhat less slender form than in the other species, rather flattened throughout and tapering but slightly, with the apex lanceolate. It is armed with three pairs of very small dorsal denticles, exclusive of the subapical spines, which are rather strong and smooth.

The uropoda (*ibid.*) are much shorter than the telson, and have the inner plate slightly projecting beyond the outer.

Habitat.—Of this species, numerous specimens were collected in a single locality, viz., at the ice-barrier in the Antarctic Ocean. They were, as usual, taken in the tow-net, at the surface of the sea. The locality is as follows :—

Station 153, February 14. 1874 ; lat. 65° 42′ S., long. 79° 49′ E.

Moreover, several very young specimens and larvæ, apparently of the same species, were collected in two other localities near that stated above, viz., at Stations 152 and 156.

Hence there cannot, I think, be the slightest doubt as to this species constituting a form quite peculiar to the Antarctic region.

20. *Euphausia macromata*, G. O. Sars (Pl. XV. figs. 9–11).

Euphausia macromata, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 19.

Specific Characters.—Form of body as in *Euphausia splendens*. Carapace with a single lateral denticle, about the middle of the inferior margin ; anterior part having a

well-marked rounded crest above; rostral projection very short. Caudal segments with fully developed epimera; third segment jutting out posteriorly as a strong dorsal spine, pointing backwards. Last segment rather elongate; preanal spine obsolete. Eyes very large, pyriform. Antennular peduncle without any dorsal lappet. Antennal scale oblong, apex narrowly truncate, outer angle unarmed. Telson elongate, tapering, with two pairs of dorsal denticles; subapical spines strong and diverging, smooth. Inner plate of uropoda scarcely at all projecting beyond outer. Length reaching 14 mm.

Remarks.—This species somewhat resembles *Euphausia splendens*. It may, however, at once be distinguished by the strong spiniform projection of the third caudal segment, a character from which the specific name is derived.

Description.—The specimens in the collection are not in the best state of preservation, but yet distinctly exhibit the prominent characters of the species. All of them are females, and the largest specimen has a length of about 14 mm.

The form of the body (see Pl. XV. fig. 9) approximates, on the whole, a good deal to that of *Euphausia splendens*, the tail being powerfully developed and well nigh twice the length of the anterior division.

The carapace has on either side a distinct lateral denticle, placed about the middle of the inferior margin, or above the point of insertion of the second pair of legs. The anterior part exhibits a very conspicuous rounded dorsal crest, and juts out as an exceedingly short rostral projection, reaching but little beyond the ocular segment.

The caudal segments have rather deep epimera, of a rounded form, except the last pair, which are triangular. The third segment juts out dorsally into a well-marked, mucroniform spine, pointing backwards, and at the end of the penultimate segment a similar but very small projection occurs. The last segment is rather produced, about as long as the two preceding ones taken together, and would seem to lack the preanal spine.

The eyes (see fig. 10) occur very large and protruding, pyriform, with the cornea greatly expanded.

The antennular peduncle (*ibid.*) does not exhibit any distinct dorsal lappet. A very small protrusion of the anterior margin of the basal joint may, however, possibly be considered the rudiment of such a part.

The antennal scale (*ibid.*) reaches a little beyond the second joint of the antennular peduncle, exhibiting an oblong form, with the apex narrowly truncate and the outer angle unarmed.

The oral parts and the legs would not seem to differ materially from those of *Euphausia splendens*.

The telson (see fig. 11) is rather elongate, and tapers gradually toward the apex, which is lanceolate and pointed. The subapical spines are strong and diverging, but

quite smooth. Moreover, two pairs of small dorsal denticles occur on the posterior half of the telson.

The uropoda (see fig. 11) are much shorter than the telson, and have the terminal plates uniform in length.

Habitat.—This species was obtained on November 18, 1875, in the South Pacific, off the coast of Chili, where a few specimens were taken at the surface of the sea.

21. *Euphausia gracilis*, Dana (Pl. XV. figs. 12–23).

Euphausia gracilis, Dana, United States Exploring Expedition, vol. xiii., Crustacea, p. 644, pl. xlii. figs. 6, *a–e*.
Euphausia gracilis, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 20.

Specific Characters.—Form of body very slender and elongate. Carapace with a single lateral denticle about the middle of the inferior margin; anterior part very slightly keeled above; rostral projection sharply pointed. Caudal segments smooth above, with very small rounded epimera. Last segment rather elongate; preanal spine simple. Eyes remarkably small, with the cornea scarcely at all expanded. Antennular peduncle without any dorsal lappet, basal joint shorter than the other two taken together. Antennal scale oblong-ovate, apex obtusely truncate, outer corner unarmed. Gills rather simple in structure, with but few digitiform lobules. Telson with two pairs of dorsal denticles; subapical spines smooth. Inner plate of uropoda much longer than outer, and reaching the tip of the telson. Length about 10 mm.

Remarks.—This form is without doubt the *Euphausia gracilis* of Dana, and in every way entitled to its specific designation, being by far the most slender species of the genus. Moreover, the animal can be recognised by its remarkably small eyes.

Description.—The length would not seem to exceed 10 mm., and accordingly the present species must take rank among the smallest belonging to this family.

The form of the body (see Pl. XV. fig. 12) appears exceedingly slender; the tail in particular is very elongate, attaining, as it does, more than twice the length of the anterior division.

The carapace is rather narrow, and exhibits on either side a single lateral denticle, placed about the middle of the inferior margin, or, more precisely, just above the point of insertion of the second pair of legs. Its anterior part is very slightly keeled above, and juts out as an acutely pointed rostral projection, reaching considerably beyond the ocular segment.

The caudal segments are quite smooth above, and have the epimera very small and rounded, but slightly projecting beneath the ventral face. The last segment is very elongate and compressed, even a trifle longer than the two preceding segments

taken together. The preanal spine (fig. 19) is exceedingly narrow and acutely pointed.

The eyes (see fig. 20) are distinguished by their remarkably small size, and almost fusiform shape, the cornea not being at all expanded, and the greatest thickness occurring in the middle of the pedicle.

The antennular peduncle (fig. 13) does not exhibit any trace of dorsal lappets. The basal joint is rather broad, but shorter than the two succeeding joints taken together. The middle joint forms at the end, above, a slight projection, reaching over the base of the terminal joint, and provided with a dense row of delicate bristles.

The antennal scale (fig. 14), slightly projecting beyond the second joint of the antennular peduncle, exhibits an oblong-ovate form, with the apex narrowly truncate and the outer corner unarmed. The basal spine is rather elongate, reaching nearly to the middle of the scale, and is armed at the inner edge with a row of strong denticles. The basal part of the flagellum appears rather powerful, but does not nearly attain the length of the scale.

The mandibular palp (fig. 15) has the terminal joint very small and oval in form; it is armed with five ciliated spines on the inner edge, and a single bristle on the outer.

The first pair of maxillæ (fig. 16) exhibit much the same appearance as in *Euphausia antarctica*.

The second pair of maxillæ (fig. 17) have the terminal joint not very large, of a rather regular ovoid form, and but sparingly supplied with bristles.

The maxillipeds and legs exhibit, on the whole, the usual structure, and have the outer joints somewhat flattened.

The gills are comparatively simple in structure and provided with a somewhat limited number of digitate lobules. The posterior pair (fig. 18), which, in other species, are richly arborescent, consist of only three comparatively short branches, one of which is bent inwards.

The copulatory appendages to the two first pairs of pleopoda in the male are rather strongly developed. Those on the first pair (fig. 22) have the outer process securiform, or projecting into two hook-shaped processes, pointing in opposite directions; the middle one is strongly bent, and finely dentate at the tip; the inner process finally has the secondary hook serrate at the outer edge. The appendages of the second pair (fig. 23) jut out into three rather broad and somewhat twisted lobes, reaching considerably beyond the apex of the principal plate.

The telson (see fig. 21) exhibits the usual slender form, and is armed with two pairs of small dorsal denticles, exclusive of the subapical spines. The latter (broken off in the specimen examined by Dana) are rather strong, but quite smooth and slightly divergent.

The uropoda (see fig. 21) have the inner plate much longer than the outer, and, when exserted posteriorly, reaching the tip of the telson.

Colour.—According to Dana, the animal, in a fresh state, is quite pellucid, without any distinct pigment.

Habitat.—A good many specimens of the present species were collected by the Expedition in different tracts of the ocean. They were all taken at the surface of the sea. The following is a list of localities, with the dates at which the specimens were obtained :—

Date.	Locality.
August 16, 1873.	Tropical Atlantic, off African coast.
June 8, 1874.	Australian Seas, off Port Jackson.
August 25, 1874.	West Pacific, Api to Cape York.
February 6, 1875.	Celebes Sea, off Mindanao.
August to September, 1875.	Tropical Pacific.
April 26, 1876.	Tropical Atlantic, off St. Vincent, Cape Verde Islands.

Dana took this form in the Pacific, lat. 15° 23′ S., long. 148° 23′ W.

Distribution.—Hence the species would seem to occur chiefly in the tropical parts of the Atlantic and Pacific Oceans, ranging southward to the Australian Seas.

22. *Euphausia gibba*, G. O. Sars (Pl. XVI. figs. 1–8).

Euphausia gibba, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 21.

Specific Characters.—Form of body very slender. Carapace with a single lateral denticle, placed behind the middle of the inferior margin : rostral projection acutely pointed. Tail gibbous in the middle, with the third segment projecting posteriorly, as an acute dorsal lappet, overlapping the succeeding segment. Last segment very elongate : preanal spine simple. Eyes rather small, slightly expanded at the tip. Basal joint of antennulæ with a very small bifid lappet at the end above. Antennal scale rather large, oblong-ovate, apex obtusely truncate, outer corner unarmed. Telson as in *Euphausia gracilis*. Inner plate of uropoda scarcely at all extending beyond outer, and not reaching tip of telson. Length about 15 mm.

Remarks.—In its external form this species very closely resembles the preceding, but may, on closer examination, be easily recognised by the peculiar gibbous form of the tail and the dorsal lappet projecting from its third segment.

Description.—The largest specimens attain a length of 15 mm., and hence the species slightly exceeds the preceding one in size.

The form of the body (see Pl. XVI. fig. 1) is very slender, though perhaps less so than in *Euphausia gracilis*.

The carapace is very similar in form and structure to that of *Euphausia gracilis*, with this exception, however, that the lateral denticle does not occur in the middle of the inferior margin, having a somewhat posterior position, just above the point of insertion of the third pair of legs. The rostral projection (see fig. 2) would appear to be a trifle narrower and very acute.

The caudal segments are on the whole more powerfully developed than in the preceding species, the epimera being also larger and more projecting inferiorly. The third segment in all the specimens forms a very conspicuous angle with that succeeding it, giving to the tail in the middle, as it were, a geniculate appearance or gibbous character, precisely as in several Caridea, for example the genus *Hippolyte*. As in that genus, moreover, an acutely pointed lappet is seen to project posteriorly from the dorsal face of the third segment, arching over the base of the following segment, to which it is closely applied when the tail is fully extended. The last segment, very elongate and slightly compressed, is about as long as the two preceding segments taken together. The pre-anal spine is nearly the same as in *Euphausia gracilis*, though in some examples a small secondary tooth occurs at its base.

The eyes (see fig. 2) are comparatively very small, but have the cornea distinctly expanded, whereby they acquire a more regular pyriform shape than in *Euphausia gracilis*.

The antennular peduncle (*ibid.*) exhibits a structure very similar to that of the preceding species, with this exception, however, that a small bifid lappet (fig. 4) occurs at the end of the basal joint above.

The antennal scale (fig. 5) is rather large, reaching appreciably beyond the second joint of the antennular peduncle; it appears, too, relatively broader as compared with that in *Euphausia gracilis*, and has an ovate form, with the apex obtusely truncate and the outer corner unarmed. The basal spine is very slender, and, as in *Euphausia gracilis*, denticulate along the inner edge.

The oral parts and the legs would not seem to exhibit any essential difference from those of *Euphausia gracilis*.

The gills are comparatively more fully developed, being furnished with a greater number of lobules, and the last pair (fig. 8) have five lobuliferous branches.

The copulatory appendages to the first pair of pleopoda in the male (fig. 6), although developed much as in *Euphausia gracilis*, still show well-marked specific differences in their structural details. Thus, the middle process exhibits a very extensive development, being highly chitinised, and bent in the middle to a hook-shaped form, whereas the two other processes are comparatively feeble in structure. The appendages of the second pair of pleopoda (fig. 7) differ but slightly from those in *Euphausia gracilis*.

The telson (see fig. 3) exhibits almost exactly the same structure as in *Euphausia gracilis*.

The uropoda (*ibid.*), on the other hand, differ essentially as regards the inner plate, which is relatively shorter, scarcely at all exceeding in length the outer, and do not nearly reach the tip of the telson.

Habitat.—Of this species, too, the collection comprises comparatively numerous specimens, all of which were taken at the surface of the sea. The following is a list of the localities, with the dates at which they were obtained :—

Date.	Locality.
February to March, 1873.	Atlantic, between Tenerife and St. Thomas.
August 11, 12, 1874.	Pacific, off Kandavu, Fiji Islands.
August 25, 1874.	West Pacific, Api to Cape York.

The distribution of the species would, therefore, seem to be much the same as that of the preceding species, comprising, as it does, the tropical regions of the Atlantic and Pacific Oceans.

23. *Euphausia spinifera*, G. O. Sars (Pl. XVI. figs. 9–16).

Euphausia spinifera, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 22.

Specific Characters.—Form of body somewhat robust. Carapace with a very strong, lateral denticle, placed in a sinus above the inferior margin, a trifle posterior to the middle; anterior part provided with an elevated crest forming midway an erect denticle; rostral projection remarkably strong, straight, acuminate; frontal margin armed with a pair of sharp-pointed supra-orbital spines. Caudal segments with large epimera; third segment projecting posteriorly as a sharp, mucroniform, dorsal spine; posterior margin of the two succeeding segments divided into several sharp-pointed lappets. Last segment elongate; preanal spine bidentate. Eyes short and thick. Antennular peduncle with a broad, indented lappet projecting from the basal joint above. Antennal scale oblong-linear, narrowly truncate at apex, outer corner projecting as a well-marked tooth. Telson very slender, with five pairs of small dorsal denticles; subapical spines finely denticulate at inner edge. Uropoda much shorter than telson, inner plate extending slightly beyond outer. Length reaching 26 mm.

Remarks.—This is a very distinct species, and easily recognised by the remarkably strong rostral projection and the spiny armature both of the anterior and posterior divisions of the body.

Description.—Four specimens only of this form were collected, the largest of which, a male, has a length of 26 mm.

The form of the body (see Pl. XVI. fig. 9) appears much more robust than in the two preceding species, and a good deal compressed.

The carapace is rather short in proportion to its height, and has on either side, posterior to the middle, a very strong denticle, which, however, does not, as is generally the case, project from the inferior margin, but occurs at some distance above it, arching over a sinus, from which a ridge extends anteriorly, joining the margin at the side of the mandibles. The anterior part of the carapace is provided with a very marked dorsal crest, jutting out in the middle as an erect tooth. The rostral projection is remarkably strong, projecting horizontally as a sharp dagger-like process, reaching nearly to the end of the basal joints of the antennulæ. Above the eyes, moreover, the frontal margin juts out, on either side, as a well-marked, somewhat upturned dentiform projection, or supra-orbital spine.

The caudal segments are powerfully developed, and provided with rather large lamellar epimera. Of these the two anterior pairs are almost quadrangular, whereas the three posterior ones exhibit a more pronounced triangular form, their posterior angle being slightly produced. The third segment, as in *Euphausia mucronata*, projects posteriorly as a strong dorsal spine, pointing straight backwards, and has, moreover, extending from the posterior margin, on either side an angular lobe. Again, the two succeeding segments are distinguished by their posterior margin being divided into several pointed lappets, one of which occupies the median line dorsally. The last segment is much narrower and more elongate than the other, although not attaining the length of the two preceding segments taken together. The preanal spine (fig. 16) is distinctly bidentate, or has a rather strong secondary tooth at the posterior edge.

The eyes (see figs. 9, 10) are very short and thick, almost globular, with the cornea exceedingly expanded.

The antennular peduncle (*ibid.*) is rather slender, and distinguished more particularly by the presence of a broad, but very thin and membranous, dorsal lobe, extending from the end of the basal joint and overlapping the base of the succeeding joint. This lobe, too, is divided at the edge into several acute lappets (see fig. 12), somewhat irregularly disposed, and forming two or three bunches. Another and very much smaller lobe is found to project from the second joint, being almost spiniform in shape, with a small lateral lappet proceeding from the outer edge (see fig. 13).

The antennal scale (see fig. 10) projects appreciably beyond the second joint of the antennular peduncle, and exhibits an oblong-linear form, with the apex narrowly truncate and the outer corner jutting out as a well marked dentiform projection.

The oral parts could not be more closely examined for want of sufficient specimens.

The structure of the maxillipeds and the legs, as also that of the gills, would seem not to differ essentially from that observed in the other species of the genus.

The copulatory appendages to the two first pairs of pleopoda in the male (see figs. 14, 15) are in every respect normal in structure, although certain slight specific differences can indeed be found by comparing them with those parts in other species.

The telson (see fig. 11) is very slender and elongate, attaining the length of the two preceding segments taken together, and exhibits no less than five pairs of minute dorsal denticles. The subapical spines are of moderate size, reaching but slightly beyond the lanceolate tip of the telson, and have their inner edge finely denticulate.

The uropoda (*ibid.*) are much shorter than the telson, and have the inner plate very narrow and only slightly overreaching the outer.

Habitat.—The four specimens procured, three of which have been mounted in glycerine on glass slides, were taken at the surface of the sea, in the following localities :—

Date.	Locality.
May 9, 10, 1874.	South of Australia, lat. 48° 18′ S., long. 30° 11′ E.
October 21, 1875.	South Pacific, about midway between New Zealand and Chili.
October 22, 1875.	South Pacific.

The distribution of this species as yet known, would accordingly seem to comprise the southern part of the Pacific Ocean.

24. *Euphausia latifrons*, G. O. Sars (Pl. XVI. figs. 17–23).

Euphausia latifrons, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 23.

Specific Characters.—Form of body rather short. Carapace without any lateral denticle ; rostral projection very peculiar in shape, forming, as it does, a broad, quadrate plate abruptly truncate at the apex. Caudal segments smooth above, with comparatively small, rounded epimera. Last segment longer than preceding, and jutting out at the end dorsally as a short dentiform projection ; preanal spine small, unguiform. Eyes clavate, cornea but slightly expanded. Antennular peduncle with a short serrate lobe extending from the basal joint above. Antennal scale subovate, apex rounded, outer corner armed with a distinct tooth. Telson with three pairs of dorsal denticles, subapical spines serrate along the inner edges. Inner plate of uropoda reaching slightly beyond outer. Length scarcely exceeding 8 mm.

Remarks.—The small size of this animal, in conjunction with the peculiar shape of the frontal plate, induced me at first to regard it merely as a larval stage of some other

form of Euphausiidæ. On closer examination, however, I felt convinced of its constituting a new and peculiar species of the genus *Euphausia*, that retained, so to speak, in the adult state, certain apparently larval characteristics. After the plate had been printed, I found among specimens of Euphausiidæ from Port Jackson, a few male examples of somewhat larger size than the one here figured, but, for the rest, closely agreeing with it in all essential characters. The most striking feature in the present species is unquestionably the very peculiar form of the frontal projection, from which character, indeed, the specific denomination has been derived.

Description.—None of the specimens exceed a length of 8 mm., most indeed are rather smaller, and hence the species may be regarded as a true pigmy form.

The body (see Pl. XVI. fig. 17) is rather short, the tail measuring about twice the length of the anterior division.

The carapace has no trace of lateral denticles, the inferior margin being quite smooth and slightly incurved. The anterior part does not exhibit any distinct keel above; it projects as a broad, well nigh quadrate plate, arching over the base of the eyes, and reaching about the middle of the basal joint of the antennulæ. This plate, too, is slightly hollowed along the middle, and at the apex abruptly truncate, or sometimes even slightly emarginate, with distinctly projecting lateral corners.

The caudal segments are smooth above and provided with comparatively small, rounded epimera. The last segment is a trifle more elongate than the preceding, and juts out at the end above as a small dentiform projection (see fig. 22). The preanal spine is very small, and unguiform.

The eyes (see fig. 18) exhibit a somewhat clavate form, having their greatest thickness in the middle of the pedicle, the cornea not being at all expanded.

The antennular peduncle (*ibid.*) is provided at the end of the basal joint above, with a very thin and membranous lobe (see fig. 19), serrate at the edge and overlapping the base of the succeeding joint. The outer corner of the basal joint is, moreover, drawn out to a strong, anteriorly pointing spine.

The antennal scale (see fig. 18) scarcely projects beyond the second joint of the antennular peduncle, and exhibits an oblong-ovate form, with the apex narrowly rounded and the outer corner drawn out to a distinct, although short, dentiform projection.

The oral parts and the legs do not seem to exhibit any essential structural peculiarities.

The gills are, on the whole, not particularly developed, the digitate lobules being in comparison few in number and the posterior pairs but slightly arborescent.

The copulatory appendages to the first pair of pleopoda in the male (see fig. 20) differ somewhat in structure from those in other species of the family, being, on the whole, much simpler, and without the strong hamiform processes generally observed. They

consist merely of three thin membranous plates, of which the median is the longest, and quite unarmed, whereas the outer one exhibits two short spiniform bristles at the apex; the inner plate is very narrow, and may strictly be regarded as the secondary lobe of the principal plate. The appendages to the second pair of pleopoda (see fig. 21) are more normal in structure, but rather small, projecting slightly beyond the apex of the principal plate.

The telson (see fig. 22) is of the usual slender form, with three pairs of small dorsal denticles. The subapical spines (see fig. 23) are rather strong, and have the inner edges finely denticulate.

Habitat.—The specimens procured during the Expedition were collected at the surface of the sea in the following localities:—

Date.	Locality.
April 4, 1874.	Off south-east coast of Australia.
June 8, 1874.	Australian Seas, off Port Jackson.
September 13, 1874.	Arafura Sea.
October 23, 1874.	Celebes Sea, off Mindanao, Philippine Islands.

The distribution of the species would accordingly seem to be restricted to the Australian Seas and those of the Indian Archipelago.

Genus 2. *Thysanopoda*, Milne-Edwards, 1830.

Thysanopoda, Milne-Edwards, Ann. d. Sci. Nat., t. xix.

Generic Characters.—General aspect as in *Euphausia*. Flagella of both pairs of antennæ greatly elongate. Exognath of second pair of maxillæ very small. Maxillipeds and anterior pairs of legs nearly as in *Euphausia*. Penultimate pair of legs distinctly developed, and of the same structure as the preceding; last pair with the endopod obsolete, but having a well-developed exopod. All the true gills provided with an interiorly bent branch; the two posterior pairs rather complex in structure, last pair much the larger and richly arborescent. Luminous globules as in *Euphausia*.

Remarks.—The present genus—that first established in the family—was founded on a form procured from the Atlantic and described by Milne-Edwards under the name of *Thysanopoda tricuspidata*. Neither this typical species, nor other forms strictly belonging to the present genus, have been recorded by any subsequent naturalists; for all the forms since described as Thysanopods ought, in my judgment, to be referred to different genera of the family. The present genus—in the restriction here adopted—is chiefly characterised by the penultimate pair of legs being fully developed and having a structure quite similar to that of the preceding pairs, whereas in the last pair the endopod is wholly wanting, the exopod only being of normal development. Moreover, in the

structure of the gills the genus shows marked differences as compared with other Euphausiidæ. In addition to the typical species first described by Milne-Edwards, three other very distinct species, apparently belonging to this genus, are represented in the Challenger collection, and will be described more in detail in the sequel. I give here a synopsis of the four species as yet known to belong to this genus.

Carapace
- with two strong lateral denticles. Rostral projection sharply pointed, and having posteriorly at its base a flattened, forward-pointing spine. Tail with the four hind segments produced posteriorly to short dorsal spines, ... *T. tricuspidata*, M.-Edw.
- with a single lateral denticle. Rostrum short, acuminate. Carapace and tail smooth above. Eyes remarkably small, . . . *T. microphthalma*, n. sp.
- without any lateral denticles. Frontal part
  - obtusely rounded. Caudal segments smooth above, ... *T. obtusifrons*, G. O. Sars.
  - produced to a distinct compressed rostrum and having an elevated crest above. Fourth and fifth caudal segments produced posteriorly to small dorsal denticles, . . . *T. cristata*, G. O. Sars.

25. *Thysanopoda tricuspidata*, Milne-Edwards (Pl. XVII.).

Thysanopoda tricuspidata, Milne-Edwards, Ann. d. Sci. Nat., t. xix. p. 451, pl. xix.

Thysanopoda tricuspidata, Milne-Edwards, Hist. nat. des Crustacés, t. ii. p. 463, pl. xxvi. figs. 1–6.

Thysanopoda tricuspidata, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 24.

Specific Characters.—Body rather slender, with the tail slightly bent in the middle. Carapace armed with two strong lateral denticles at the inferior margin; frontal part produced to a sharp-pointed rostrum, and having above, in the middle, a flattened anteriorly directed spine. Third caudal segment projecting posteriorly as a strong dorsal spine; the three posterior segments armed with similar, but much smaller spines. The two anterior pairs of caudal epimera curved anteriorly; first pair very large and divided into two acuminate lappets. Last segment rather elongate; preanal spine bidentate. Eyes large and projecting, pyriform. Antennular peduncle slender, cylindrical, with a small narrow lanceolate lappet at the end of the first and second joints above. Antennal scale oblong-linear, apex narrowly rounded, outer corner jutting out as a small denticle. Penultimate pair of legs much smaller than preceding. Telson with four pairs of dorsal denticles, apex greatly produced, and armed close to the tip with two pairs of exceedingly minute secondary teeth; subapical spines of moderate length, smooth. Uropoda shorter than the telson, inner plate a little longer than the outer. Length 24 mm.

Remarks.—I have felt some doubt in referring this form to the typical species, as neither the very strong spine on the third caudal segment, nor the peculiar flattened spine of the carapace, behind the rostrum, has been represented in the figure given in

Milne-Edwards' work. On the other hand, this figure shows distinctly another feature, very characteristic of thepresent species, and not found, so far as I know, in any other form, viz., the peculiar shape of the two anterior pairs of caudal epimera. Moreover, in several other respects, for example, in the form of the maxillæ, the present animal agrees perfectly with Milne-Edwards' species, and hence I cannot but regard them as identical.

Description.—Most of the specimens collected are rather small, and apparently not yet full grown; but there is in the collection one specimen—a female—much larger than the others, and measuring 24 mm. in length. This example, which, I believe, has attained its full size, is represented in Pl. XVII. fig. 1, whereas the anatomical figures were prepared from one of the smaller specimens.

The form of the body (see fig. 1) is rather slender and somewhat compressed, with the tail, in all the specimens, exhibiting a marked bend in the middle, the three posterior segments being more or less deflexed, forming an obtuse angle with the anterior ones.

The carapace is rather deep in its posterior part, and exhibits on either side two strong and rather distant denticles projecting from the inferior margins, the anterior placed just above the point of insertion of the maxillipeds, the posterior above the base of the penultimate pair of legs. The anterior part of the carapace is much narrower than the posterior, and juts out as a sharp-pointed rostral projection, reaching beyond the middle of the basal joint of the antennulæ. Immediately beneath the base of this projection occurs a very minute denticle, and on the dorsal face, a little behind the rostrum, is seen a rather strong and somewhat flattened spine, pointing straight forwards.

The caudal segments are powerfully developed, and provided with rather large epimera. Of these, the two anterior pairs curve forwards, whereas the three posterior ones are directed obliquely backwards, having the posterior angle somewhat produced. The first pair of epimera are much the largest, and exhibit a rather peculiar form, being, as it were, divided into two acute and anterior curving lappets, the posterior of which is the larger and provided with a small secondary tooth at the inferior margin; the anterior lappet would seem to be partly overlapped by the hinder margin of the carapace. The four posterior segments project at the end, above, as well-marked acute spines, pointing backwards, of which that of the third segment is much the largest. The last segment is rather elongate, with the preanal spine distinctly developed, and armed at the base with a small secondary denticle.

The eyes (see fig. 2) are very large and protruding, pyriform, with the cornea considerably expanded.

The antennular peduncle (fig. 5) is comparatively slender, and almost cylindrical in form, with the basal joint about as long as the two others taken together. It exhibits above two very narrow lanceolate lappets, the one extending from the end of the basal joint, the other originating from the second joint. Moreover, the outer corner of the basal joint is drawn out to a strong forward-pointing spine.

The antennal scale (see fig. 6) projects but very slightly beyond the second joint of the antennular peduncle, and exhibits an oblong-linear form, with the apex narrowly rounded and the outer corner jutting out as a small but distinct dentiform projection. The basal spine is very narrow and quite smooth, and the basal part of the flagellum slender, with the two outer joints equal in length.

The anterior and posterior lips (figs. 7, 8) differ but slightly in structure from those of *Euphausia*, nor do the mandibles (fig. 9) show any characteristic feature, their palp being relatively small, with the last joint oblong in form.

The first pair of maxillæ (fig. 10) are more particularly distinguished by the unusually small size of the exognath, which for the rest exhibits the usual structure.

The second pair of maxillæ (fig. 11) have comparatively a slight development, with the exognath almost obsolete and the terminal joint ovate.

The general structure of the maxillipeds (fig. 12) and of the five anterior pairs of legs (figs. 13–15) agrees very nearly with that in *Euphausia*. On the other hand, the two last pairs exhibit very marked differences.

The penultimate pair of legs (fig. 16), which in *Euphausia* are quite rudimentary, are developed precisely as the preceding pairs, exhibiting, as they do, the full number of endopodal joints, together with a fully developed exopod. In the present species, this pair, however, is somewhat smaller than the preceding, having the meral joint scarcely longer than the ischial, and the terminal part (three last articulations) much shorter than the meral joint.

The last pair of legs (see figs. 17, 17*a*) want every trace of an endopod, but have the exopod in every respect normally developed.

The gills (figs. 17, 20–25) exhibit certain well marked differences in structure as compared with those in *Euphausia*. With the exception of the simple epipodal lobes, which in this genus, as in *Euphausia*, are affixed to the maxillipeds (see figs. 12, 19), and, in a strict sense, correspond to the true branchiæ, all of them exhibit a secondary branch, springing from the main stem at the base interiorly, and backwards gradually becoming more developed. On the gills belonging to the two first pairs of legs (figs. 20, 21) this branch, in the specimen dissected, was quite simple, and in appearance similar to that of the gill-lobules arising from the outer edge of the curved stem. On the succeeding pair (fig. 22) the branch was considerably larger, and exhibited two short lateral lobes on either side. That of the fourth pair of gills (fig. 23) had three well-developed lobes on either side, besides a smaller one at the base. On the fifth pair of gills (fig. 24), too, three bipartite lobes have made their appearance at the base of the branch, in addition to the six simple ones; and on the sixth (penultimate) pair (fig. 25) two of these basal lobes had assumed a structure similar to the main stem (or outer branch), being fringed along one of the edges with a row of well-developed gill-lobules. The last pair of gills (see fig. 17) are much larger than any of the preceding, and consist of two principal stems pointing in

opposite directions, both of which, but more particularly the outer one, are furnished with numerous secondary branches beset with regular rows of gill-lobules. It should, however, be noted, that the specimen submitted to dissection was not yet full grown, and accordingly the gills here figured may be strictly somewhat less complex than in adult animals.

The caudal limbs, or pleopoda (fig. 18), do not differ in their structure from those in other Euphausiidæ.

The telson (see fig. 3) exhibits the usual slender form, tapering gradually toward the apex, which is much produced and drawn out to a very acute point. On examining this point under a high magnifying power, it is found to be armed on either side with two very small secondary teeth (see fig. 3*a*). Moreover, on the dorsal face of the telson four pairs of small denticles occur, disposed at regular intervals. The subapical spines project but very slightly beyond the tip of the telson, and are quite smooth.

The uropoda (*ibid.*) are shorter than the telson, and have the inner plate a trifle longer, but much narrower than the outer.

The luminous globules agree in every respect, as to number, arrangement, and structure, with those of the genus *Euphausia*.

Habitat.—The specimens of this form collected during the Expedition were taken at the surface of the sea in two different localities:—

Date.	Locality.
August 11 to 12, 1874.	Pacific, off Kandavu, Fiji Islands.
August 25, 1874.	West Pacific, Api to Cape York.

Exclusive of these specimens having the aspect peculiar to the adult animal, the characteristic larval form of this species (to be described further on) has been met with in many other localities, showing the distribution of the species to be rather extensive. I annex a list of localities:—

Date.	Locality.
August 23, 1873.	Tropical Atlantic (Station 104).
January 9, 1875.	Off Luzon, Philippine Islands.
February 6, 1875.	Off Mindanao, Celebes Sea.
February 1875.	West Pacific, north of New Guinea.
August 24, 1875.	Pacific, 400 miles south of Hawaii, Sandwich Islands.
August 30, 1875.	Tropical part of Pacific.
September 12, 1875.	Tropical part of Pacific.
March 21, 1876.	South Atlantic (Station 338).
April 6, 1876.	Tropical part of Atlantic.
May 12, 1876.	North Atlantic.

The specimen examined by Milne-Edwards—a full-grown female—came from the Atlantic. Hence the species would seem to inhabit the tropical regions of the Atlantic and Pacific Oceans, sometimes, however, occurring to the north and south of the tropical zone.

26. *Thysanopoda obtusifrons*, G. O. Sars (Pl. XVIII. figs. 1–14).

Thysanopoda obtusifrons, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 25.

Specific Characters.—Form of body rather stout, not very much compressed. Carapace without lateral denticles or dorsal crest, frontal part slightly produced, but obtusely rounded, not forming any distinct rostral projection. Caudal segments smooth above, with epimera of moderate size, none anteriorly curved, the three middle pairs slightly sinuate at the inferior edge. Last segment longer than preceding; preanal spine obsolete. Eyes very small. Antennular peduncle remarkably strong, with rather a large and densely hispid lappet projecting from basal joint above, and overlapping base of second joint. Antennal scale broad, ovate, with apex rounded and outer corner unarmed; basal portion of flagellum very strong and massive. Terminal joint of first pair of maxillæ exceedingly narrow, that of second, on the contrary, very large and broad. Penultimate pair of legs but very little shorter than preceding, with meral joint very elongate. Outer branch of anterior pairs of gills exceedingly small. Telson having above two parallel serrate keels, apex bluntly lanceolate, subapical spines strong and diverging. Inner plate of uropoda shorter than outer. Length reaching 23 mm.

Remarks.—The present form, although differing in its general form very appreciably from the typical species, should unquestionably be regarded as a true *Thysanopoda*, agreeing, as it does, comparatively closely in all the essential anatomical features adduced as characteristic of that generic type.

Description.—Only three specimens of this form were secured, one of which I saw fit to sacrifice for dissection, with the object of determining the generic relationship of the species. The largest of the specimens measures 23 mm. in length.

The form of the body (see Pl. XVIII. fig. 1) would appear to be rather stout, and not compressed by far to the same extent as in the preceding species, both the carapace and the tail occurring broadly rounded above.

The carapace does not exhibit any trace of lateral denticles, the inferior margin being quite smooth and slightly incurved in its anterior part. A very slight keel occurs above on the anterior part, but no trace of any cervical impression can be detected. The frontal part projects somewhat in the middle above the bases of the eyes, without, however, forming any true rostrum, the end of the projection being obtusely rounded off (see fig. 2).

The caudal segments are quite smooth above, and have the epimera of moderate size

and of the usual form, none of them exhibiting a peculiar development. The three middle pairs are slightly sinuate at the inferior edge, whereas the last pair have a rounded triangular form, with the posterior angle produced. The last segment is somewhat elongate, without any distinct preanal spine.

The eyes (see fig. 2) are comparatively rather small, and do not project at all toward the sides, their pedicle being very short, and the cornea but slightly expanded.

The antennular peduncle (fig. 4) is very powerfully developed, with the two outer articulations unusually stout and cylindrical in form. The basal joint appears somewhat flattened, and sends off at the end, above, a broad membranous lobe, overlapping the base of the second joint. This lobe, too, is densely hispid above, and furnished at the inner edge with a row of strong bristles.

The antennal scale (see fig. 5) projects scarcely beyond the second joint of the antennular peduncle, and is rather broad, oval in form, with the apex evenly rounded off, and the outer corner unarmed. The basal spine is very narrow, and quite smooth. The flagellum, in all the specimens, was defective, but may no doubt originally have been very elongate, since the basal part exhibits a most unusually strong and massive appearance.

The mandibular palp (fig. 6) agrees as to form and relative size with that of the typical species, though much more densely beset with bristles, and has, too, the last joint somewhat conically pointed.

The first pair of maxillæ (fig. 7) are in particular distinguished by the remarkably narrow form of the terminal joint, whereas the masticatory lobes, as also the exognath, occur more fully developed than in *Thysanopoda tricuspidata*.

The second pair of maxillæ (fig. 8) have the terminal joint unusually large and broad, as also furnished with numerous bristles, those springing from the inner edge being very slender and elongate.

The maxillipeds do not differ essentially from those in the preceding species.

The first pair of legs have the last joint (fig. 9) remarkably short and compressed, almost triangular in form, and, exclusive of the apical setæ, furnished at the inner edge with a dense row of comparatively short ciliate bristles, the anterior of which is recurved.

The succeeding pairs of legs (see fig. 1) are rather slender, and diminish successively in length backwards.

The penultimate pair of legs (fig. 10) do not appear much shorter than the one preceding them, and have the meral joint comparatively elongate, as also the terminal part more fully developed than in *Thysanopoda tricuspidata*.

The last pair of legs (see fig. 12) do not exhibit, as in the typical species, the slightest trace of an endopod, whereas the exopod is in every respect normally developed.

The five anterior pairs of gills (see fig. 10) have the exterior branch very small, not attaining by far the size of the interior, which is somewhat elongate, and furnished along

both edges with numerous gill-lobules. On the penultimate pair (see fig. 11) the exterior branch is much more developed, and divided into several curving stems. The last pair of gills (fig. 12), finally, agree closely in structure with those in the preceding species, both of the branches being strongly developed, and provided with numerous secondary stems.

The copulatory appendages to the first two pairs of pleopoda in the male (figs. 13, 14) exhibit in their general structure very considerable resemblance to those in the genus *Euphausia*.

The telson (see fig. 3) is very slender, and tapers gradually posteriorly, with the apex, however, not nearly so produced as in *Thysanopoda tricuspidata*, but obtusely lanceolate in form, as also wanting the secondary denticles occurring in that species. On the upper face of the telson occur two parallel longitudinal keels, distinctly serrate throughout almost their whole length. The subapical spines are very strong and divergent, extending far beyond the tip of the telson, and have their inner edge sharpened but quite smooth.

The uropoda (*ibid.*) appear scarcely shorter than the telson, and have the outer plate both broader and longer than the inner.

The colour, according to a sketch, apparently of this species, by Sir. J. D. Hooker, is light brown. One of the Challenger specimens has here and there partly retained this tint, the posterior part of the tail, for example, exhibiting numerous dark brown pigment-spots (see fig. 1).

Habitat.—The Challenger specimens were collected in the two following localities:—

Date.	Locality.
?	Pacific, one specimen, treated with carmine.
October 14, 1875.	South Pacific, from tow-net attached to the trawl, two specimens (one dissected).

The distribution of the species is therefore, so far as yet known, apparently restricted to the Pacific Ocean.

27. *Thysanopoda cristata*, G. O. Sars (Pl. XVIII. figs. 15–20).

Thysanopoda cristata, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 26.

Specific Characters.—Body rather compressed. Carapace without lateral denticles; anterior part with a well-marked crest along the middle; rostral projection rather strong, cultrate, with a small denticle above near the tip. Caudal epimera comparatively large; fourth and fifth segments with a small dorsal spine; last segment scarcely longer than

preceding, preanal spine obsolete. Eyes very short. Antennular peduncle without distinct dorsal lappets, but exhibiting an unusually strong seta that issues from inner corner of last joint. Antennal scale oval in form, with rounded apex and outer corner jutting out as a well-defined tooth. Telson with six pairs of dorsal denticles, apex but slightly produced, subapical spines smooth. Inner plate of uropoda shorter than outer. Length 55 mm.

Remarks.—There cannot, I think, be any doubt whatever as to this form also being a true *Thysanopoda*, though the oral parts and gills could not in the single specimen taken be submitted to a close examination. The species may be readily distinguished from either of the two preceding ones by its strongly compressed body, elevated dorsal crest, and peculiar rostrum.

Description.—Only a single specimen of this species, an adult male, was secured. It has a length of as much as 55 mm., and accordingly ranks among the largest forms of the Euphausiidæ.

The body (see Pl. XVIII. fig. 15) is rather stout, but very much compressed throughout.

The carapace lacks, as in *Thysanopoda obtusifrons*, every trace of lateral denticles, the inferior margins being quite smooth and evenly incurved along the middle. The anterior part has a well-marked and somewhat elevated crest in the middle, and juts out as a distinctly developed rostrum, reaching almost to the end of the basal joint of the antennulæ. The form of the rostrum is also in this species somewhat different from that usually met with in the Euphausiidæ, being somewhat cultrate, with a sharp carina both at the upper and the lower side, the former constituting a continuation of the dorsal crest of the carapace. Its apex is drawn out to a sharp somewhat deflexed point, and a little behind the latter a very small denticle occurs on the upper edge of the rostrum.

The caudal segments are very powerfully developed, with rather large epimera of a slightly irregular form, the three middle ones being, as in *Thysanopoda obtusifrons*, sinuate along the inferior edge. The three anterior segments are quite smooth above, whereas the two succeeding ones exhibit a small spiniform projection in the middle of the posterior margin. The last segment scarcely exceeds in length the preceding, and does not exhibit any trace of a preanal spine.

The eyes (see figs. 15, 16) are very short, almost globular in form, and project but little, if at all, beyond the sides.

The antennular peduncle (see fig. 16) is rather strong, with the anterior border of the basal joint somewhat thickened and densely setose, though not constituting a true lobe, and the outer corner is produced as a spiniform projection. The second joint projects above at the end as a small triangular lappet, overlapping the base of the terminal joint. The latter exhibits at the inner edge, near the tip, a remarkably strong

forward directed seta, which at the first glance may be taken for a third flagellum. The true flagella are exceedingly elongate, nearly equalling the length of the whole body.

The antennal scale (see fig. 16), reaching but slightly beyond the second joint of the antennular peduncle, is rather broad, of an oval form, and obtusely rounded at the tip, with the outer corner jutting out as a well marked though rather small denticle. The flagellum is very elongate, even slightly exceeding in length those on the antennulæ.

The oral parts of course could not be accurately examined in the single specimen preserved.

The maxillipeds and legs, as also the gills, would not appear to differ essentially from those parts in *Thysanopoda obtusifrons*.

The copulatory appendages to the first pair of pleopoda (fig. 19) are somewhat similar to those in the last species. A few minor differences may, however, be found in the structural details. Thus, both the hook-shaped processes of the outer part are quite simple, subulate, whereas in *Thysanopoda obtusifrons* one is slightly dilated at the tip and the other distinctly angulate at the base. The appendages to the second pair (fig. 20) agree almost exactly with those in the above mentioned species.

The telson (see fig. 17) is of moderate length, tapering uniformly towards the apex, which is acutely pointed. The subapical spines (see fig. 18) are comparatively small and scarcely at all divergent, as also quite smooth. Moreover, on the dorsal face of the telson may be seen about six pairs of small denticles.

The uropoda (see fig. 17), when extended backward, reach a little beyond the tip of the telson, and exhibit between the plates a relation similar to that in *Thysanopoda obtusifrons*, the inner being appreciably shorter than the outer.

Habitat.—The only specimen secured was brought up in the trawl from a considerable depth in the Celebes Sea, south of Mindanao, Philippine Islands—Station 213, February 8, 1875; lat. 5° 47′ N., long. 124° 1′ E.; depth, 2050 fathoms; blue mud.

In all probability the specimen in question did not actually enter the trawl at that enormous depth, but most likely was taken by the net during its upward passage from some intermediate stratum of the sea.

28. *Thysanopoda microphthalma*, n. sp. (Woodcut, Fig. 3).

Specific Characters.—Form of body comparatively slender. Carapace with a single lateral denticle, projecting from the inferior margin far behind the middle; anterior part very slightly keeled above, and jutting forth as a well-marked acuminate rostrum. Caudal segments smooth above, with epimera not very large. Last segment longer than preceding; preanal spine distinct unguiform. Eyes exceedingly small, rounded. Antennular peduncle strong, with a densely hispid lobe projecting from the basal joint

above and drawn out to a strong spine. Antennal scale oblong-ovate; apex rounded, with no denticle on outer corner. Penultimate pair of legs much shorter than preceding. Telson with numerous small dorsal denticles. Inner plate of uropoda scarcely shorter than outer. Length 15 mm.

Remarks.—Of this form, not recorded in my Preliminary Notices, the collection contains a single, apparently young, specimen, stained with carmine and mounted on a glass slide. It is somewhat defective, wanting, as it does, several of the legs, as also the outer part of the telson. Quite recently I have, however, had an opportunity of examining another specimen of the same species, in an excellent state of preservation, brought home by the Norwegian traveller, Mr. Lumholtz. I have thus been enabled to make out the distinctive characters with greater precision, and at the same time been fully convinced that the form in question constitutes a new and well-marked species of the genus

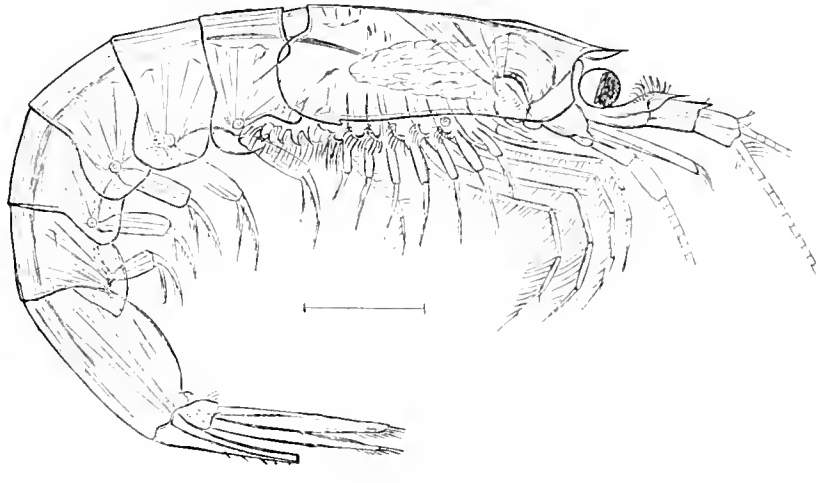


Fig. 3. *Thysanopoda microphthalma*, n. sp.

Thysanopoda. Owing to the species not being figured in the plates, I have subjoined a woodcut, exhibiting the Challenger specimen from the right side. This form is closely allied to *Thysanopoda obtusifrons*, from which, however, it may be at once distinguished by the sharply pointed rostrum and the well-marked lateral denticle of the carapace. Moreover, its specific designation is derived from the remarkably small size of the eyes.

Description.—The Challenger specimen has a length of 15 mm. That secured by Mr. Lumholtz, which appears full grown, is considerably larger, measuring about 22 mm. in length. Both specimens are females.

The form of the body (Fig. 3) appears somewhat more slender than in any of the preceding species.

The carapace has on either side a well-marked lateral denticle, extending from the inferior margins far behind the middle, or, more precisely, just above the base of the penultimate pair of legs. Its anterior part is very slightly keeled above, and projects

as a well defined, though rather short, acutely pointed rostrum, somewhat compressed in its outer part.

The caudal segments in the Challenger specimen would appear to be quite smooth above, whereas in that obtained by Mr. Lumholtz a distinct, though very small, dentiform process is seen projecting above from the end of the third segment. The epimera are of the usual appearance, rather small in the Challenger specimen, a trifle larger in the other. The last segment is somewhat longer than the preceding, and exhibits at the end, inferiorly, a well-marked unguiform preanal spine.

The eyes are exceedingly small, more so even than in *Thysanopoda obtusifrons*, and of a rounded form, with the cornea occupying about the outer half of the eye.

The antennular peduncle is rather strong, and not unlike that of *Thysanopoda obtusifrons* in form, having, as in that species, a densely hispid lobe projecting above from the end of the basal joint. This lobe, however, has in the present species the outer corner drawn out to a strong spiniform projection, and, moreover, another but much smaller lobe occurs extending above from the second joint.

The antennal scale would appear to have much the same form as that in *Thysanopoda obtusifrons*, though perhaps a trifle more oblong.

As regards the oral parts and the gills, no detailed examination could be made, for want of sufficient material.

The legs present apparently a close resemblance to those in *Thysanopoda obtusifrons*, saving, however, that the penultimate pair is relatively somewhat shorter.

As stated above, the outer part of the telson was broken off in the Challenger specimen. In the other (Mr. Lumholtz's) it is of moderate size, and furnished with about nine pairs of small dorsal denticles, exclusive of the subapical spines, which are somewhat slender and smooth.

The uropoda, when extended posteriorly, reach a little beyond the tip of the telson, and have the inner plate but very little shorter than the outer.

Habitat.—The Challenger specimen was taken at the surface of the sea, in the North Atlantic, May 3, 1876; lat. 26° 21′ N., long. 33° 37′ W.

The specimen procured by Mr. Lumholtz was likewise obtained with the surface-net, but in the tropical region of the Atlantic, lat. 7° N., long. 23° W.

The distribution of the species as yet known, would accordingly appear restricted to the Atlantic Ocean.

Genus 3. *Benthenphausia*, n. gen.

Generic Characters.—Body scarcely compressed. Eyes imperfectly developed. Flagella of both pairs of antennæ greatly elongate. Antennular peduncle remarkably short and stout. Oral parts very peculiar in structure. Mandibles strongly developed,

with greatly expanded masticatory part, cutting edge but slightly dentate; palp very large. First pair of maxillæ with anterior masticatory lobe strongly projecting and coarsely spinous along the edge; palp small but distinctly tri-articulate; exognath drawn out posteriorly as a narrow lappet. Second pair of maxillæ with a prodigiously developed palp, consisting of three distinctly defined lamellar articulations. Maxillipeds rather strong, pediform. All of the legs distinctly developed, with the joints more or less lamellar, expanded; last pair rather short, but having both endopod and exopod well defined and of a structure similar to that in the preceding pairs. Gills very fully developed, the three posterior pairs exceedingly complex; last pair by far the largest. Telson comparatively short. Uropoda with the plates remarkably broad, outer one distinctly jointed near the apex. Luminous globules apparently wanting.

Remarks.—This genus I have seen fit to establish for the reception of the anomalous form recorded by myself at an earlier date as *Thysanopoda amblyops*, and first examined from a defective specimen only. Having since found in the collection another somewhat broken specimen, I had the means of making a more detailed anatomical investigation and thus became convinced, that the form in question constitutes the type of a specially distinct and very peculiar genus. More particularly the oral parts exhibit a most remarkable structure, totally different from that in any other known genus of Euphausidians. Moreover, the gills present certain well-marked peculiarities of structure; and finally, the genus is the only one in which all the legs, even the last pair, are fully developed. The imperfect development of the eyes would seem to support the assumption of the present form being a true deep-sea animal; and hence I have deemed it advisable to designate the genus accordingly.

29. *Bentheuphausia amblyops*, G. O. Sars. (Pl. XIX., Woodcut, Fig. 4).

Thysanopoda (?) amblyops, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 27.

Specific Characters.—Body almost cylindrical in form. Carapace without any lateral denticles, anterior part very slightly keeled above, with frontal margin produced in the middle into an acute angle. Caudal segments smooth above, with rather small, rounded epimera. Last segment somewhat longer than preceding, preanal spine obsolete. Eyes very small, with pedicle narrow, cylindrical, and slightly expanded at the end above, cornea exceedingly minute, with light pigment and imperfectly developed visual elements. Antennular peduncle short and thick, somewhat flattened at base, with an acute lobe projecting from basal joint above. Antennal scale almost reaching extremity of antennular peduncle, oblong-ovate in form, apex obliquely rounded, outer corner scarcely at all projecting. Telson flattened, tapering, with two pairs of small dorsal denticles; apex pointed, subapical spines smooth. Uropoda scarcely, if at all, longer than telson.

with outer plates the larger, and exhibiting exteriorly a small tooth somewhat remote from the apex. Length reaching 48 mm.

Remarks.—Among the drawings executed during the expedition by the late Dr. v. Willemoes-Suhm, there is one that undoubtedly represents this species, and as the specimen from which the drawing was executed, according to the subjoined notes, must have been very considerably larger than the ones examined by myself, and had, too, all its legs uninjured, I have seen fit to reproduce the figure in the annexed cut. In his manuscript notes, the late lamented naturalist has only recorded this interesting form as *Thysanopoda* sp. ?—Unfortunately, the specimen has been lost, and hence the following description has been worked out in all essential particulars from the smaller ones, examined by myself.

Description.—The length of the specimen represented in Pl. XIX. fig. 1, is 20 mm.,

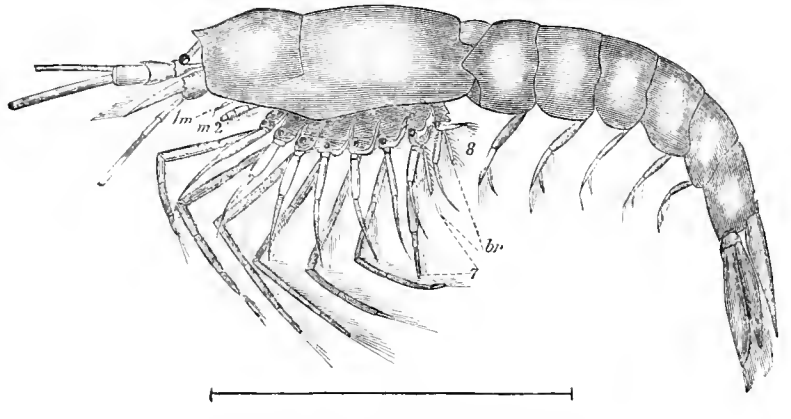


Fig. 4. *Bentheuphausia amblyops*, G. O. Sars, n. gen.

and that selected for anatomical investigation had very nearly the same size. The specimen examined by the late Dr. v. Willemoes-Suhm, and figured in the accompanying cut, was much larger, measuring, as stated by that author, not less than 48 mm. in length. All three specimens were females.

The form of the body (see Pl. XIX. fig. 1, and accompanying cut) is somewhat slender, and differs from that in most other Euphausiidæ in being very little, if at all, compressed, but nearly cylindrical throughout.

The carapace has not a trace of lateral denticles, the inferior margins being quite smooth and almost straight. The anterior part is defined posteriorly by a slight cervical impression, and exhibits above, in the middle, a low keel, obsolete anteriorly. The frontal margin projects in the middle as an acute angle extending above the bases of the eyes, without, however, forming any true rostrum. The antero-lateral corners of the carapace are obtusely truncate. Posteriorly, the carapace forms a deep and narrow emargination, leaving, as usual, the dorsal part of the last segment of the trunk uncovered.

The caudal segments are quite smooth above, and provided with comparatively rather small, rounded epimera. The last segment somewhat exceeds in length the preceding, and does not exhibit any trace of a preanal spine.

The eyes (see figs. 2 and 4) are remarkably small, incompletely developed, and do not in the least project beyond the sides of the carapace. The pedicle is narrow cylindrical, but expands at the end, above, as a knob-like prominence. The cornea occupies only a small part of the eye, and is distinguished by its light, whitish pigment, as also by the surface exhibiting no true corneal facets or other visual elements, but merely an indistinct and irregular areolation.

The antennular peduncle (figs. 5, 6) is remarkably short and thick, with the basal joint somewhat flattened, and about as large as the other two taken together; moreover, it juts out above at the end, somewhat interiorly, as a pointed process, bearing on the inner edge a row of stiff incurved bristles (see fig. 6). The flagella were broken off in the specimens examined, but would seem to have been rather elongate, judging from the thickness of the still remaining basal part, more especially of the outer flagellum.

The antennal scale (fig. 7) about equals in length the antennular peduncle, and exhibits an oblong-ovate form, the apex being broadly rounded and somewhat oblique, with the outer corner not in the least projecting, and armed with a very minute denticle. The basal spine is likewise very small, nearly obsolete, whereas the peduncle of the flagellum is very strong, reaching to the tip of the scale. The terminal part of the flagellum was broken off in the specimens examined, but may no doubt have been very elongate.

The anterior lip (fig. 8) is comparatively large, and has the lateral corners a good deal projecting; for the rest, it shows the stucture characteristic of the family.

This will also apply to the posterior lip (fig. 9), the terminal lobes of which have the usual triangular form.

The mandibles (figs. 10, 11) are very strong, with the masticatory part considerably expanded, securiform, and scooped out a little anteriorly. The cutting edge is sharpened and exhibits a small number only of scattered teeth, somewhat differently arranged on the two mandibles (see fig. 10). The palp is comparatively very large, fully equalling the mandible itself in length. Of its joints, the middle one is by far the largest, and rather broad, as also fringed along both edges with strong ciliated bristles. The last joint is oblong, and furnished along the inner edge with a double series of bristles.

The maxillæ (figs. 12, 13) exhibit a structure very different from that observed in any hitherto known form of Euphausiidæ, and would thus fully warrant the generic distinctness of the present form.

The first pair of maxillæ (fig. 12) have the two masticatory lobes very unequally developed, the posterior lobe forming merely a broad, lamellar expansion of the basal part, fringed along the edge with a dense row of plumose setæ, whereas the anterior lobe projects very considerably, and is dilated into a somewhat securiform apex, which is

armed along the edge with a rather large number of strong spines, unequal in size. The palp, unlike that of other Euphausiidæ, is distinctly triarticulate, though very small, the middle joint being the largest, and furnished along the inner edge with a row of strong bristles, whereas the basal and terminal joints are quite unarmed. The exognath, finally, constitutes an oval plate, without any bristles, and of a peculiar almost spongy structure. Moreover, it is specially distinguished by the posterior part being drawn out into a narrow, finely ciliate, lobe.

The second pair of maxillæ (fig. 13) exhibit a perhaps still more anomalous aspect, owing to the prodigious development of the palp. The latter, constituting, as it does, in all other known Euphausiidæ, only a single lamellar joint, occurs here as a large trunk, fully equal in length to the remaining part of the maxilla, and composed of three well-defined lamellar expanded articulations, giving to the maxilla, as it were, a pediform appearance. Of the joints, the first is by far the largest and very broad, oval in form, and fringed along the inner edge with numerous long curving plumose setæ. The two outer joints rapidly diminish in size, and are likewise provided with strong plumose setæ along the inner edge, as also a few much shorter ones at the outer. The remaining part of the maxilla exhibits, on the whole, a normal appearance, having interiorly four densely setose masticatory lobes, and exteriorly a small lamellar exognath edged with short ciliate bristles.

The maxillipeds (fig. 14) exhibit the usual pediform structure, having, however, the proximal part remarkably robust, with the joints much appressed, whereas the distal part, consisting of the outer three joints, would seem to be somewhat slender and very movably jointed to the former. The meral joint, by far the largest, slightly exceeds in length the distal part. All the joints are provided along the inner edge with a number of slender scattered bristles. The masticatory lobe, issuing internally from the coxal joint, is found on closer examination (see fig. 15) to consist of two superposed lappets, both edged with strong curving setæ. The exopodite is rather powerfully developed, reaching beyond the middle of the meral joint. The epipodite, finally, constitutes a small membranous plate, projecting both anteriorly and posteriorly as a rounded lobe.

All the legs, save the last pair, had been broken off in the specimens I examined, only their basal parts along with the gills and exopods being left. In the specimen, however, examined by the late Dr. v. Willemoes-Suhm, they had suffered no mutilation and were fully represented in the figure drawn by that naturalist, of which the annexed cut is an accurate copy. As seen from the figure, they are rather elongate, but relatively coarser in structure, than in other Euphausiidæ, the joints being much appressed and densely setose.

The last pair of legs (fig. 18) are much smaller than the rest, and in the specimens examined were almost entirely hidden between the gills, so as readily to escape attention. Hence, too, they came to be quite overlooked by myself as also by the late Dr. v.

Willemoes-Suhm, who simply states in his manuscript notes, that they occurred as a mere rudiment. On dissecting one of the specimens in the collection, I found them, however, developed precisely as the rest, both the exopod and endopod being well defined, the latter as a distinctly articulate stem, differing merely in having the terminal part very small and composed of only two articulations.

The gills (see figs. 16–24), although on the whole presenting the structure and arrangement characteristic of the family, yet exhibit certain striking peculiarities. They increase successively in size posteriorly, and become, as they do so, more complex in structure, the three hindmost pairs being richly arborescent. In no other form of Euphausiidæ does the homology of the gills to the epipod admit of being better demonstrated than in the present animal. For in the anterior pair (see figs. 16 and 19) the epipod-plate retains precisely the original aspect it has in the maxillipeds, whereas the true branchial part is found to be merely an out-growth from the exterior face of this plate, in the form of a curved stem fringed along its posterior edge with a regular series of gill-lobules of the usual structure. In the second pair (fig. 20) the interior extremity of the epipod-plate has become somewhat produced, and from its apex a single minute gill-lobule has taken origin, whereas the outer gill-stem remains unaltered. In the third pair (fig. 21) the inner part of the epipod-plate has taken a still more striking gill-like aspect, several other gill-lobules having made their appearance on its edge; and in the following pair, this would appear characteristic to a still greater extent. Finally, in the fifth and sixth pairs (figs. 22, 23), the inner part of the epipod-plate has been so greatly modified as to assume the aspect of the principal part of the gill, furnished, as it is, with several spirally arranged gill-stems, each subdivided into numerous lobules. Yet in all those pairs, the outer part of the epipod-plate has remained almost unchanged, forming a simple rounded lobe, of a peculiar, as it were spongy structure, and projecting above the true gills (see fig. 1). The last pair of gills (see figs. 18–24) are very large, and, as usual, exhibit two principal diametrically diverging sections, both of which are divided into numerous secondary branches, partly spiral in arrangement, and all of them furnished at one of their edges with a regular series of gill-lobules.

The pleopoda (fig. 25) do not exhibit any marked peculiarities of structure.

The telson (see fig. 3) is relatively less produced than in other Euphausidians, and scarcely longer than the last segment. Moreover, it is somewhat flattened throughout, tapering gradually toward the apex, which is sharply pointed. The subapical spines are rather slender, reaching far beyond the tip of the telson, and perfectly smooth. On the dorsal face of the telson occur in addition two pairs of very small denticles.

The uropoda (*ibid.*) scarcely extend beyond the telson, and have both plates comparatively broad and lamellar. The inner plate, which is the shorter, is lanceolate and fringed all round with plumose setæ. The outer plate is oblong in form, and exhibits, contrary to what is the case in other Euphausiidæ, in its outer part a distinct

transverse suture, marking off a linguiform terminal joint, as in *Gnathophausia* or *Eucopia*; its outer edge is quite straight and naked, terminating in a small dentiform projection, whence the above mentioned suture runs inward.

Of luminous globules I failed on dissection to detect any trace whatever. True, the late Dr. v. Willemoes-Suhm observes in his manuscript notes having indistinctly been able to trace a number of accessory eyes (Nebenaugen) on the anterior division of the body, and has also represented such organs in his drawing (see woodcut, fig. 4, p. 110) as occurring at the bases of all the legs. But, to judge from the place assigned, I feel convinced that he has obviously taken for accessory eyes the incrassated outer lobe of the epipod-plates, these, perhaps, being more vividly coloured than the rest.

Colour.—According to the manuscript notes of the late Dr. v. Willemoes-Suhm, the whole body of the animal in a fresh state, unlike what occurs in other Euphausiidæ, is quite opaque and of a similar vivid-red colour to that in most other true deep-sea Crustaceans.

Habitat.—The two specimens examined by myself were taken in the following localities:—

October 1873, off Tristan da Cunha; depth, 1000 fathoms.

Station 107, August 26, 1873, Tropical Atlantic; lat. 1° 22′ N., long. 26° 36′ W.; depth, 1500 fathoms; Globigerina ooze; bottom temperature, 37°·9.

The specimen examined by the late Dr. v. Willemoes-Suhm was obtained south of Australia, in the following locality:—

Station 158, March 7, 1874; lat. 50° 1′ S., long. 123° 4′ E.; depth, 1800 fathoms; Globigerina ooze; bottom temperature, 33°·5.

As regards distribution, this form, therefore, would appear to inhabit the abysses of the Atlantic and Southern Oceans.

Genus 4. *Nyctiphanes*, G. O. Sars, 1883.

Nyctiphanes, G. O. Sars, Preliminary Notices on the Challenger Shizopoda.

Generic Characters.—General appearance as in *Euphausia*. Flagella of both pairs of antennæ greatly elongate. Antennular peduncle elongate, cylindrical, stronger in male than in female, basal joint provided above at extremity with a reflexed membranous leaflet. Oral parts and anterior legs very nearly as in *Euphausia*. Penultimate pair of legs distinctly developed, but differing from the rest in the endopod consisting of two elongate joints only. Last pair of legs quite rudimentary, forming a minute non-articulate and flexuose stem, without any bristles. Last pair of gills rather complex, remaining pairs comparatively simple, main stem expanded at extremity and drawn out as two diverging points. Ovisac double. Luminous globules as in *Euphausia*.

Remarks.—This genus is mainly characterised by the peculiar reflexed leaflet on the

antennular peduncle, as also by the structure of the two hindmost pairs of legs, both of which are rather dissimilar, as compared with those in other Euphausiidæ. Moreover, the structure of the gills is somewhat different. Finally, the genus is highly distinguished by the presence in the female of a double ovisac. Besides the new species described below, the northern form, *Thysanopoda norvegica*, M. Sars, which, perhaps, is identical with *Thysanopoda couchii* of Bell, belongs to this genus. The generic name proposed here is a translation into Greek of the appellation "*Noctiluca*," adapted by W. Thompson for a form of this family, but preoccupied in zoology for a Protozoon.

30. *Nyctiphanes australis*, G. O. Sars (Pl. XX.; Pl. XXI. figs. 1–7).

Nyctiphanes australis, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 28.

Specific Characters.—Form of body rather slender. Carapace without any lateral denticles, anterior part distinctly keeled above; rostral projection very short; frontal margin forming on either side, above the eyes, an obtuse angle. The two anterior caudal segments having the posterior margin slightly produced in the middle; epimera of moderate size, subtriangular, pointing obliquely backward. Last segment not longer than preceding; preanal spine obsolete. Eyes large and protruding, pyriform. Antennular peduncle very elongate, outer corner of basal joint drawn out to a sharp spine, dorsal leaflet comparatively small, with inner corner acute, outer edge entire. Antennal scale not nearly reaching the tip of second joint of antennular peduncle, narrow, sublinear, outer corner produced as a well-marked tooth. Mandibular palp remarkably elongate. Legs very slender, antepenultimate and penultimate pairs in female wanting exopod. Last joint of penultimate pair half as long as preceding joint. Penultimate pair of gills without secondary branch. Telson with obtusely lanceolate apex; subapical spines slender and smooth. Inner plate of uropoda a trifle longer than outer, and reaching tip of telson. Ovisacs conoid, affixed in part to antepenultimate pair of legs. Length reaching 17 mm.

Remarks.—From the northern form, *Nyctiphanes norvegica* (M. Sars), this species is easily distinguished by its more slender form, the absence of lateral denticles on the carapace, the much more elongate antennular peduncle, the form of the dorsal leaflet thereon, and, finally, by a somewhat different relation in size between the two joints of the endopod of the penultimate pair of legs. Moreover, the structure of the gills and the form and arrangement of the ovisacs would seem to be somewhat different in the two species.

Description.—The length of the adult male is about 17 mm., that of the female somewhat less.

The form of the body in both sexes (see Pl. XX. fig. 1; Pl. XXI. fig. 1) is rather slender, but somewhat different as regards the relation in size between the anterior and posterior divisions, the latter being more fully developed in the male (see Pl. XXI. fig. 1), and

about twice as long as the former, whereas in the female (Pl. XX. fig. 1) the difference in length between the two divisions is much less.

The carapace lacks every trace of lateral denticles, the inferior margins being quite smooth and nearly straight. The anterior part is marked off posteriorly by a slight cervical impression, and exhibits above a distinct, though somewhat low keel. The frontal margin juts out in the middle (see Pl. XX. fig. 3; Pl. XXI. fig. 2) as a comparatively short triangular projection, reaching but very little beyond the ocular segment, forming, too, on either side, above the eyes, an obtuse angle. The antero-lateral corners of the carapace constitute a distinctly projecting angle. Posteriorly, the carapace exhibits a rather deep emargination (see Pl. XXI. fig. 3), from which juts on either side a narrow sinus, disrupting the hinder margin.

The caudal segments are all nearly uniform in length, but diminish hindwards successively both in breadth and height. The two foremost have the posterior margin very slightly produced above in the middle, but, in other respects, these segments are quite smooth above. The epimera are of moderate size and somewhat triangular in form, pointing obliquely backward and terminating in an acute angle. The last segment is relatively very short, its length not exceeding that of the preceding, and wants the slighest trace of a preanal spine.

The eyes (see Pl. XX. fig. 2; Pl. XXI. fig. 2) are very large, projecting towards either side, pyriform, with the cornea greatly expanded.

The antennular peduncle is somewhat different in the two sexes. In the female (Pl. XX. figs. 4–6) it is exceedingly slender, and scarcely exceeds half the length of the carapace, whereas in the male (see Pl. XXI. figs. 1, 2) it is much more powerfully developed, attaining almost the whole length of the carapace. The basal joint is somewhat flattened, and projects at the outer corner as a sharp tooth. The dorsal leaflet, springing, above, from the end of this joint, is reflexed, as in the northern species, but comparatively more simple in structure, having only the inner corner acutely produced, whereas the edges are evenly curved and quite smooth. The second joint is very elongate, attaining almost the length of the basal joint, and, in the female, very narrow and perfectly cylindrical in form, whereas in the male (see Pl. XXI. fig. 2) it is much thicker, and exhibits at the inner edge, near the apex, an obtuse prominence that lies in close contact with the corresponding prominence on the opposite side, when the peduncles are extended in their normal position. The last joint is only half as large as the former, and in the male remarkably dilated and somewhat curved. The flagella are very elongate, and composed of numerous short articulations.

The antennal scale (see Pl. XX. fig. 7) is comparatively small, not nearly reaching the end of the second joint of the antennular peduncle, and exhibits a rather narrow, nearly linear form, tapering slightly, however, toward the apex, which is narrowly truncate, with the outer corner produced as a well-defined tooth. The basal spine is very

small and quite smooth. The basal part of the flagellum is rather elongate, in the female about equalling the length of the scale, in the male (see Pl. XXI. fig. 4) considerably projecting beyond its apex, and having the last joint remarkably large and tumid.

The anterior and posterior lips (Pl. XX. figs. 8, 9) do not exhibit any marked peculiarities of structure.

The mandibles (fig. 10) are comparatively powerful, with the cutting edge (see fig. 11) divided, as usual, into several sharp teeth, and exhibiting besides a well-marked molar protuberance. The palp (see fig. 10) is remarkably slender and elongate, exceeding even the body of the mandible in length, and has the terminal joint nearly as long as the medial, as also somewhat expanded towards the tip, and armed along the inner edge with a row of ciliated bristles, which at the apex assume the character of strong curved spines.

The first pair of maxillæ (fig. 12) have the terminal joint, or palp, rather small and narrow, whereas the exognath is very large and oval in form, with only a pair of minute bristles at the anterior extremity.

The second pair of maxillæ (fig. 13) exhibit the usual structure, with the terminal joint approximately triangular in shape.

The maxillipeds (fig. 14) occur, as usual, quite pediform and very slender, with the terminal joint (fig. 14*a*) linear and furnished along the inner edge with a row of small ciliated bristles, besides a few longer setæ. The epipodite forms a very small, narrow, triangular lamella, affixed to the outer side of the coxal joint.

The legs (see Pls. XX., XXI. fig. 1) are exceedingly slender and elongate, as also densely setose, with the ischial joint longest. They increase somewhat in length as far as the third pair, where they gradually diminish a little in size. On the first pair (fig. 15) the terminal joint occurs but very slightly expanded, having, however, the usual bunch of ciliated bristles near the tip (see fig. 15*a*). In this pair, as in the three succeeding (see fig. 16), the terminal part, consisting of the three outer articulations, is much longer than the meral joint, whereas in the antepenultimate pair (fig. 17) this part is much reduced in size. On the other hand, in this pair the ischial joint is very elongate, being twice as long as the meral. The penultimate pair of legs (fig. 18) occur entirely without the terminal part, the endopod being composed of only two joints, the last of which (meral) scarcely attains half the length of the preceding. On both of the last mentioned pairs the exopod is wholly wanting in the female, whereas in the male this part occurs distinctly developed (see Pl. XXI. fig. 5). The last pair of legs (Pl. XX. figs. 19, 20) are quite rudimentary, being in greater part completely hidden between the posterior gills; they constitute a small, somewhat flexuose naked stem springing from a somewhat thickened basal part, and exhibiting an exceedingly soft consistence, similar to that of the gill-stems.

The gills increase, as usual, successively in size from before backwards, forming a regular series along the sides of the trunk below the carapace. The six anterior pairs

(see figs. 15–18) are comparatively simple in structure, and perfectly similar in appearance, occurring as single stems expanded at the extremity into two short diverging corners, and having along the hinder edge a regular series of digitiform gill-lobules, diminishing in length towards each extremity. The last pair (fig. 19), on the other hand, are very large and complex, divided as usual into two principal portions pointing in opposite directions, the posterior of which is the larger, and provided with several curved secondary branches, each having along one of its edges a regular series of gill-lobules.

The pleopoda of the female (fig. 21) do not exhibit any essential peculiarities of structure.

The copulatory appendages to the two first pairs of pleopoda in the male (see Pl. XXI. figs. 6, 7) are, on the whole, not so fully developed as in most other Euphausiidæ. Those on the first pair (fig. 6) form a somewhat curved lamella, doubling over the inner plate of the pleopod, and with the inner edge finely serrate. From this lamella, also, proceed two comparatively small processes, the outer of which is mucroniform and highly chitinised, whereas the inner is narrow linguiform, and quite soft. Moreover, a slender incurved spine is seen to spring from a rounded prominence on the outer margin. The appendages of the second pair of pleopoda (fig. 7) constitute merely a slight two-lobed expansion of the inner edge of the principal plate.

The telson (see Pl. XX. fig. 22) exhibits the usual slender form, tapering gradually toward the apex, which is but slightly produced and bluntly lanceolate (see fig. 23). The subapical spines are of moderate length and perfectly smooth. Moreover, two pairs of small denticles occur on the dorsal face of the telson.

The uropoda (see fig. 22) have the inner plate very narrow and a trifle longer than the outer, reaching, when extended posteriorly, to the tip of the telson. The outer plate of each is rather broader, and truncate at the apex, with the outer corner projecting as an acute angle.

Of the female specimens in the collection, two are ovigerous, a condition very rarely met with among preserved specimens of Euphausiidæ. The eggs were deposited in two well-defined ovisacs (see Pl. XX. figs. 1, 2) placed side by side beneath the posterior part of the trunk. These ovisacs do not consist of incubatory lamellæ, as in other Schizopoda, but merely of an exceedingly thin membrane, derived, it would seem, from some glutinous fluid issuing along with the ova and coagulated by the action of the sea-water as a delicate envelope surrounding and keeping the ova together during the embryonal development. In form, the ovisacs are somewhat conical, being broadest posteriorly and gradually tapering forward, where they are connate with the inner half of the ischial joint of the antepenultimate pair of legs, covering too, exteriorly, a considerable part of the succeeding pair. This peculiar arrangement of the ovisacs fully suffices, it would seem, to account for a striking anomaly met with in the present species and mentioned above, viz., the total absence of exopods on the posterior pairs of legs in the females. It is, indeed, evident that these organs would be quite inoperative, and

even actually burdensome to ovigerous animals, as the ovisacs would to a very considerable extent interfere with their free mobility; hence their development in the females is quite arrested in that region, whereas in the male they are retained, as usual, on all the legs, except the last (see Pl. XXI. figs. 1, 5). Of the northern species, *Nyctiphanes couchii*, Bell (= *Nyctiphanes norvegica*, M. Sars?), an ovigerous specimen has on one occasion only been observed, viz., by Professor Bell, in whose well-known work on the British Stalk-eyed Crustacea, the ovisacs are recorded and figured as two rotund sacs depending freely from the posterior part of the trunk. The form and arrangement of the ovisacs in the two species accordingly exhibit well-marked differences, though agreeing in their being not confluent, as is the case in other forms of Euphausidians.

As regards the luminous apparatus, the number and arrangement of the globules perfectly agrees with that described above in the genus *Euphausia*.

Habitat.—Of the present species rather numerous specimens, besides some few larvæ in a very early stage of development, to be described further on, were collected in three different localities off the Australian coast. All the specimens were taken in the surface-net, and in most instances at night. The localities were as follows:—

Date.	Locality.
April 2, 1874.	Off East Moneœur Island, Bass Strait.
April 3, 1874.	Off Cape Howe, south-eastern coast of Australia.
June 8, 1874.	Off Port Jackson, east coast of Australia.

With respect to distribution, the species would accordingly appear to be wholly confined within the limits of the Australian Seas.

Genus 5. *Thysanoëssa*, Brandt, 1851.

Thysanoëssa, Brandt, Middendorf's sibirische Reise, Zoologie.

Generic Characters.—Body more or less slender, tapering posteriorly. Carapace short, distinctly rostrate, antero-lateral corners produced. Eyes of somewhat irregular form, cornea divided, as it were, into two segments by a transverse constriction. Flagella of both pairs of antennæ very short. Antennular peduncle without any dorsal leaflet, basal joint much flattened, the two other narrow and elongate. Terminal joint of second pair of maxillæ comparatively small, exognaths in both pairs well developed. Maxillipeds slender, not very elongate. First pair of legs very strongly developed, and much longer than the rest, geniculate, meral and carpal joints very elongate and nearly naked, propodal joint compressed, and provided on both edges with strong, spiniform

bristles, terminal joint very small and spinous. Remaining pairs of legs successively diminishing in size. Penultimate pair of legs exceedingly small, endopod bi-articulate, exopod distinct. Last pair of legs quite rudimentary, forming only a small linguiform and setose plate. The three posterior pairs of gills sending off a branch inwards; exterior branch in all as in *Nyctiphanes*. Luminous apparatus of the usual structure.

Remarks.—This genus was established by Brandt for the reception of an Arctic species from the Siberian Sea, *Thysanoëssa longipes*. I have recorded[1] two species from the Norwegian coast, *Thysanoëssa borealis* and *Thysanoëssa tenera*, and in the Challenger collection there are two other species described below. Thus the genus comprises at present five different species. They all agree in the characters stated above, the most striking of which is the strong development of the first pair of legs.

The two Challenger species may be briefly characterised in the following manner:—

Body	comparatively clumsy, with last segment only slightly longer than preceding. Rostrum narrow, lanceolate. First pair of legs exceeding half the length of body. Eyes remarkably large, ...	*T. gregaria*, n. sp.
	very slender, with last segment exceedingly elongate and narrow. Rostrum triangular, broad at base. First pair of legs not nearly attaining half the length of body. Eyes of moderate size, ...	*T. macrura*, n. sp.

31. *Thysanoëssa gregaria*, G. O. Sars (Pl. XXI. figs. 8–17; Pl. XXII.).

Thysanoëssa gregaria, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 29.

Specific Characters.—Form of body rather short and clumsy. Carapace with a well-marked lateral denticle behind the middle of the inferior margin; rostrum produced, straight, narrow lanceolate. Caudal segments smooth above, with slightly angular epimera. Last segment somewhat longer than preceding, preanal spine very large, forming a broad plate, serrate at posterior edge. Eyes remarkably large, irregularly globose, upper part of cornea narrowed. Antennal scale reaching beyond second joint of antennular peduncle, oblong, tapering, apex obliquely rounded, with outer corner projecting. First pair of legs, when extended, exceeding half the length of body, meral joint reaching tip of antennular peduncle. Telson with two pairs of dorsal denticles, apex acuminate; sub-apical spines smooth. Inner plate of uropoda a trifle longer than outer, scarcely reaching tip of telson. Length 18 mm.

Remarks.—This species may at once be distinguished from the three northern forms by its relatively short and clumsy body, as also its remarkably large eyes. Moreover, the peculiar form and strong development of the preanal spine would seem to afford a good specific character.

Description.—The average length of adult females is about 18 mm. The males are, as a rule, somewhat smaller.

[1] Oversigt over Norges Crustaceer, Bd. i., pp. 52, 53, 1882.

The form of the body (see Pl. XXI. figs. 8, 9) appears rather short and clumsy, and slightly compressed. It tapers gradually from before backwards, and has the tail about twice the length of the anterior division.

The carapace is comparatively short, and exhibits on either side a well-marked lateral denticle jutting out from the lower margins somewhat posterior to the middle, or rather, just above the insertion of the antepenultimate pair of legs. Its anterior part is defined posteriorly by a slight cervical impression, and exhibits above a distinct, though not very elevated, keel, continued along the upper face of the rostral projection. The latter (see fig. 12) is rather produced, reaching considerably beyond the middle of the basal joint of the antennulæ, and has a narrow lanceolate form, being somewhat appressed at the sides. In the male this projection (see fig. 17) exhibits a somewhat different aspect, being remarkably constricted at the base and slightly expanded at the apex, which is bluntly lanceolate. The antero-lateral corners of the carapace (see fig. 8) are drawn out to a rather prominent acute-angled lobe, overlapping externally the basal part of the antennæ. The posterior emargination of the carapace is not very deep, and without any lateral sinus.

The caudal segments are quite smooth above, and diminish successively in height posteriorly. The epimera are well developed, and of a somewhat angular form, pointing obliquely backwards. The last segment is a trifle longer than the preceding, and somewhat narrow. The preanal spine (fig. 16) exhibits a rather characteristic appearance, being very broad, lamellar, and with coarse denticles, arranged in a pectinate manner, along the posterior edge.

The eyes (see figs. 10, 11) are very large and thick, irregularly globose, with the pedicle very short, and the cornea greatly expanded. The latter is, as in other species of the genus, somewhat contracted in its upper part, and divided, as it were, into two unequal sections by a slight transverse impression, crossing the cornea a little above the mesial part.

The antennular peduncle (figs. 13, 14) is rather slender, and scarcely exceeds in length half the carapace. The basal joint is about as long as the two others taken together, and very much flattened, with the anterior border somewhat projecting above and densely setose, as also exhibiting, at some distance from the inner corner, a narrow indentation. Its outer corner is drawn out to a dentiform projection, and a little below the inner, two strong plumose setæ are seen to originate. The two outer joints are very narrow, and cylindrical in form, the last a trifle longer than the other. The flagella (see fig. 12) are both exceedingly short, scarcely half as long as the peduncle, and composed of ten to twelve short articulations.

The antennal scale (see fig. 15) is comparatively large, reaching far beyond the second joint of the antennular peduncle. It exhibits a somewhat oblong form, and tapers gradually toward the apex, which is very obliquely rounded, with the outer

corner somewhat projecting, the inner obsolete. The basal spine is comparatively small, and quite smooth. The basal part of the flagellum almost equals the scale in length, and is very slender, with the middle joint longest; the terminal part does not attain the length of the basal, and consists of only eight articulations.

The anterior lip (Pl. XXII. fig. 1) exhibits the usual structure.

The posterior lip (fig. 2) has the terminal lobes of a somewhat rounded form, with a small ledge-like projection at the outer edge.

The mandibles (fig. 3) are rather strong, their masticatory part expanded in the usual manner, the cutting edge (see fig. 5) divided into several acute teeth, and forming also a well-defined molar tubercle. The palp (see figs. 3, 4) is comparatively small, not nearly attaining the length of the body of the mandible, and has the terminal joint lamelliform, as also provided along the inner edge with a dense row of ciliated bristles, the outermost of which has the character of a strong spine.

The first pair of maxillæ (fig. 6) present on the whole a normal appearance, having, however, the exognath somewhat large and expanded.

The second pair of maxillæ (fig. 7) are mainly characterised by the small size and triangular shape of the terminal joint, or palp. The exognath, too, appears more fully developed than in any of the preceding genera, constituting, as it does, a distinctly projecting triangular plate, drawn out anteriorly to a very acute angle, and fringed along the outer edge with a dense row of plumose setæ.

The maxillipeds (fig. 8) are exceedingly slender, though not particularly elongate, scarcely reaching, when extended anteriorly, beyond the antennal scale. Of the joints, the meral is by far the longest, exceeding even in length the three outer ones taken together. The terminal joint (see fig. 9) is relatively very small, and provided with several slender bristles, two of which issue from a ledge-like prominence at the outer edge. The exopodite is remarkably elongated, reaching nearly to the tip of the meral joint, and in size appreciably exceeds the true exopods on the legs. The epipodite, on the other hand, is very small and lobular.

The first pair of legs (fig. 10) are most powerfully developed, and much larger than any of the others, exceeding, as they do, when fully extended, half the length of the whole body. As a rule they exhibit, however, a strong geniculate bend, the terminal part, comprising the three outer joints, being abruptly reflexed, and thus forming with the remaining part a more or less acute angle. The proximal part of the leg generally extending straight forward, reaches nearly to the tip of the antennular peduncle. Of the joints, the meral and carpal are exceedingly elongate and almost naked, as also very movably connected with each other, the meral joint being by far the larger of the two, and tapering somewhat towards the apex. The carpal joint is very slender, and slightly dilated at the extremity, where it has on both edges a few short bristles. The propodal joint is about half as long and linear in form, and exhibits along both edges a regular

series of close upon eight spiniform ciliated setæ, those on the inner edge being the longer. The terminal joint is very small, and armed with about five strong curved spines.

The four succeeding pairs of legs (figs. 11–15) rapidly diminish in length, and are likewise strongly geniculate, but, unlike what is observed in the first pair, exhibit a uniform fringe of delicate bristles along their edges. The terminal joint (see fig. 12) is comparatively short in all of them and of a conical form, whereas the two preceding joints are nearly equal in size.

The penultimate pair of legs (figs. 16, 18) are exceedingly small, and, as a rule, completely hidden between the gills, but nevertheless have both the endopod and exopod well defined; the former, however, consists only of two joints, both of which are fringed with strong ciliate bristles.

The last pair of legs (figs. 17, 19) are quite rudimentary, constituting merely a very small linguiform, setiferous lamella, originating from a thickened basal part, and apparently representing the exopod.

The gills, although approximating in appearance to those in the genus *Nyctiphanes*, nevertheless exhibit certain well-marked differences. The three anterior pairs (see figs. 10, 11, 13, 20) merely constitute, as in that genus, simple stems expanded at the extremity as two short branches, curving in opposite directions and provided along the posterior edge with a regular series of gill-lobules. In the three succeeding pairs (see figs. 14–16, 21–23), however, besides this outer stem, another projects inward, also with gill-lobules, which, however, are somewhat spirally disposed. The last pair of gills (see figs. 17, 24) are, as usual, the largest of all, and exhibit in every respect a normal appearance, the outer division having along its outer edge four curved secondary stems, besides two somewhat smaller ones at the apex.

The spermatophores (fig. 25) are distinctly pedunculer, the distal part being expanded into a rounded oval vesicle, whereas the proximal part forms a very narrow flexuose stem or neck.

The pleopoda of the female are of the usual structure, and in the male the two anterior pairs have well developed copulatory appendages. Those of the first pair (see figs. 27, 29) are very strong, consisting of two lamellar portions folded one upon the other, the outer of which projects as two highly chitinised processes, slightly dilated at the apex, and exhibiting a sharpened and finely serrate edge; moreover, from a rounded prominence of this portion springs exteriorly a short, curved spine. The inner portion, too, is drawn out to a linguiform projection, with a small unguiform process at the tip, and has too, on the outer side, a strong spiniform process, whereas on the inner is affixed the cincinnigerous lobe. The appendages of the second pair of pleopoda (see figs. 28, 30) constitute an irregularly folded lamellar process, extending beyond the tip of the principal plate.

The telson (see fig. 26) exhibits the usual slender form, and has the apex somewhat produced and acutely pointed. The subapical spines are of moderate length, and perfectly smooth. Moreover, two pairs of very small denticles occur on the dorsal face of the telson.

The uropoda (*ibid.*) have the inner plate very narrow, and reaching almost to the tip of the telson when extended posteriorly. The outer plate is a trifle shorter, but much broader, and projects at the apex, exteriorly, as an acute corner.

The luminous globules agree perfectly both as to number and arrangement with those in *Euphausia*.

Colour.—Some specimens in the collection, preserved in glycerine, have the whole surface of the body, and more particularly that of the tail, dotted over with small stellate pigment-spots of a dark reddish colour.

Habitat.—Numerous specimens of this characteristic form were collected in the Expedition in different tracts of the ocean. Especially in one locality of the South Atlantic, the species would seem, to judge from the considerable number of specimens obtained, to have occurred in great abundance along with *Nematoscelis megalops*, a form of Euphausiidæ to be described further on. All the specimens were taken at the surface of the sea. The localities were as follows:—

Date.	Locality.
December 19, 1873.	South of Cape of Good Hope.
May 9, 10, 1874.	Off Australian coast.
June 14, 1874.	Off Australian coast.
June 15, 1874.	Off Australian coast, Sydney to Wellington.
July 10, 1875.	North Pacific.
July 1875.	North Pacific, Japan to Honolulu.
October 21, 1875.	South Pacific.
October 22, 1875.	South Pacific.
January 21, 1876.	South Atlantic, between Falkland Islands and Patagonia.
February 11, 1876.	South Atlantic, south of Buenos Ayres.
March 3 to 5, 1876.	South Atlantic, east of Buenos Ayres.
March 10, 1876.	South Atlantic.
March 11, 1876.	South Atlantic.
March 13, 1876.	South Atlantic.
May 6, 1876.	North Atlantic.

The same species I have also observed in the Mediterranean, at Messina.

Distribution.—The distribution of the species would accordingly seem to be very extensive, ranging, as it does, from the Mediterranean, throughout the whole of the North and South Atlantic, the Australian Seas, and the Pacific as far north as Japan.

32. *Thysanoëssa macrura*, G. O. Sars. (Pl. XXIII. figs. 1–4).

Thysanoëssa macrura, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 30.

Specific Characters.—Form of body very slender. Carapace with a single lateral denticle posterior to the middle of lower margin; rostral projection forming a triangular plate, broad at base, with apex acutely pointed. Caudal segments smooth above, with very small rounded epimera. Last segment exceedingly slender and elongate, preanal spine small, with only two denticles at posterior edge. Eyes somewhat smaller than in *Thysanoëssa gregaria*. Antennal scale very narrow, sublinear. First pair of legs much smaller than in last species, meral joint scarcely reaching beyond middle of antennal scale. Telson very slender. Inner plate of uropoda much longer than outer. Length reaching 13 mm.

Remarks.—This species may be at once distinguished from *Thysanoëssa gregaria* by the slender form of its body, and more particularly by the great length and slenderness of the last caudal segment. Moreover, the form of the rostrum is somewhat different, and the first pair of legs much less elongate than in that species.

Description.—Most of the specimens in the collection are immature; but a few examples would seem to be nearly full grown. The largest of these has a length of 13 mm. They are all females.

The form of the body (see Pl. XXIII. fig. 1) is much more slender than in the preceding species, and the tail in particular is remarkably elongate and narrow; hence the specific name.

The carapace resembles that in the last species, both as regards its general form and the situation of the lateral denticle, but differs in the shape of the rostral projection. The latter (see fig. 2) is not so sharply defined from the carapace as in that species, forming merely an appressed triangular process of the frontal margin, and terminating in a very acute point, that reaches beyond the middle of the basal joint of the antennulæ.

The caudal segments are very narrow, almost cylindrical, and provided with very small, rounded epimera. The last segment is remarkably elongate and slender, about as long as the two preceding taken together, and perfectly cylindrical in form. The preanal spine (fig. 4) is much smaller than in *Thysanoëssa gregaria*, and armed with only two denticles at the posterior margin.

The eyes (figs. 1, 2), although exhibiting a very similar form to those in the preceding species, are yet by comparison appreciably smaller.

The antennular peduncle (fig. 2) would seem to be a trifle more slender, agreeing, however, in other respects perfectly as to structure with those in *Thysanoëssa gregaria*.

The antennal scale (*ibid.*) likewise appears somewhat narrower, almost linear in form.

The first pair of legs (fig. 1) are not nearly so strongly developed as in the latter

species, the geniculate bend between the meral and carpal joints reaching to the middle only of the antennal scale.

The telson (see fig. 3) is very elongate and slender, with the apex acutely pointed and the subapical spines smooth.

The uropoda (*ibid.*) have the inner plate very considerably produced beyond the outer, and reaching to the tip of the telson.

Habitat.—All the specimens in the collection were taken in the tow-net at the surface of the sea. The following is a list of the localities :—

Date.	Locality.
December 24, 1873.	Southern Ocean, between Cape of Good Hope and Kerguelen.
December 29, 1873.	Southern Ocean, between Cape of Good Hope and Kerguelen.
January 23, 1874.	Southern Ocean, off Kerguelen.
February 3, 1874.	Southern Ocean, between Kerguelen and Heard Islands.
February 14, 1874.	Antarctic Ocean, at the ice-barrier.
February 19, 1874.	Antarctic Ocean, at the ice-barrier.
February 14, 1876.	South Atlantic, south of Buenos Ayres.

As regards distribution, the species would therefore appear to be wholly confined within the southern hemisphere, inhabiting, as it does, exclusively the Antarctic and South Atlantic Oceans.

Genus 6. *Nematoscelis*, G. O. Sars, 1883.

Nematoscelis, G. O. Sars, Preliminary Notices on the Challenger Schizopoda.

Generic Characters.—Form of body and structure of eyes and antennæ almost as in *Thysanoëssa*. Mandibular palp very small. Terminal joint of second pair of maxillæ likewise exceedingly minute. Maxillipeds slender, with last joint somewhat appressed and densely setose at the inner edge; epipodite obsolete. First pair of legs remarkably elongate and slender, well-nigh filiform, with a bunch of spiniform setæ at the apex, but for the rest almost naked. The four succeeding pairs of legs rather short and thick, with the terminal part not nearly attaining the length of the meral joint. Penultimate pair of legs very small, with the endopod bi-articulate. Last pair of legs quite rudimentary, forming only a lamellar setiferous plate (exopod). The two anterior pairs of gills simple, and of a similar structure to those in *Thysanoëssa;* remaining pairs composed of two distinct branches; last pair by far the largest. Ovisac simple, flattened. Luminous apparatus of the usual structure.

Remarks.—This genus is most nearly allied to *Thysanoëssa*, but differs, among other characteristics, very materially in the structure of the legs, the first pair of which are

eminently distinguished by their great length and slender form, giving them a nearly filiform appearance, hence the generic denomination. Four different species of this genus are represented in the Challenger collection, a synopsis of which is given below :—

Carapace	without any lateral denticle. First pair of legs	longer than body. Eyes very large, . .	*N. megalops*, G. O. Sars.
		shorter than body. Eyes comparatively small,	*N. microps*, G. O. Sars.
	with a well-marked lateral denticle. Rostrum	acute, reaching to middle of basal joint of antennulæ. Body very slender, . .	*N. tenella*, G. O. Sars.
		greatly produced, reaching beyond middle of basal joint of antennulæ. Body comparatively short, ...	*N. rostrata*, G. O. Sars.

33. *Nematoscelis megalops*, G. O. Sars (Pl. XXIII. figs. 5–10 ; Pl. XXIV.).

Nematoscelis megalops, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 31.

Specific Characters.—Body rather thickset, gradually tapering from before backwards. Carapace without any lateral denticles, anterior part keeled above, rostrum exceedingly narrow, subulate, curving gently downward. Penultimate and antepenultimate caudal segments slightly keeled above, and jutting out in the middle of the posterior margin as small dentiform projections. Last segment longer than preceding; preanal spine unguiform, with a small denticle at base. Eyes of enormous size, irregularly globose, cornea contracted in middle. Antennal scale reaching almost to the tip of the antennular peduncle, exceedingly slender, linear, apex narrowly truncate, with outer corner projecting. First pair of legs remarkably elongate and slender, attaining, when fully extended, the length of the whole body, meral joint reaching far beyond tip of antennular peduncle, propodal joint a trifle shorter than carpal : terminal joint very minute. Telson rather elongate, with apex acutely produced ; subapical spines smooth. Inner plate of uropoda longer than outer, and projecting beyond tip of telson. Length 26 mm.

Remarks.—The present species may be regarded as the type of this genus, and is chiefly characterised by the extraordinary length of the first pair of legs and the prodigious development of the eyes, as also by its remarkably narrow and curved rostrum, and the slender form of the antennal scale.

Description.—All the specimens in the collection are females, the largest has a length of 26 mm.

The body (Pl. XXIII. figs. 5, 6) is rather thickset and but slightly compressed, tapering gradually from before backwards, with the tail about twice the length of the anterior division.

The carapace is comparatively short, and lacks every trace of lateral denticles, the inferior margins being perfectly smooth and slightly incurved in the middle. The

anterior part has a well-marked keel running along the dorsal face, and juts out as an exceedingly narrow, subulate rostrum, curving gently downward, and reaching almost to the end of the basal joint of the antennulæ (see figs. 8, 9). The antero-lateral corners of the carapace are produced into an acute lobe, overlapping at the side the basal part of the antennæ. The posterior emargination is somewhat deep, exposing as usual the dorsal part of the last segment of the trunk,

The caudal segments diminish successively both in height and breadth posteriorly, and have the epimera distinctly projecting beneath the ventral face, and of a rounded form The antepenultimate and penultimate segments are slightly keeled above, the keel jutting out posteriorly into small dentiform projections. The last segment is appreciably longer than any of the preceding, and a little compressed, exhibiting a distinct unguiform preanal spine, usually found armed at the base with a small secondary tooth (fig. 7).

The eyes (see Pl. XXIV. fig. 1) are prodigiously developed, and of larger size, perhaps, than in any other known form of Podophthalmia. They are irregularly globose in shape, with the cornea greatly expanded, and, as it were, divided into two sections by a well-marked transverse impression running straight across the middle.

The antennular peduncle (Pl. XXIV. fig. 2) is rather slender, and exhibits a structure very similar to that in the genus *Thysanoëssa*, the basal joint being rather flattened, whereas the two outer ones are narrow, cylindrical, about equal in length, and, taken together, as long as the basal joint. The anterior border of the basal joint projects somewhat above, and has, as in *Thysanoëssa*, a distinct indentation in the middle, the outer corner jutting out as an acute denticle, whereas the inner is obtuse and provided with two very strong recurved setæ. The flagella are, as in *Thysanoëssa*, very short, scarcely exceeding half the length of the peduncle.

The antennal scale (fig. 3) exhibits a remarkably narrow, nearly linear form, and reaches almost to the tip of the antennular peduncle; its apex is very narrowly truncate, with the outer corner projecting as a small tooth, the inner rounded off. The basal spine is very short and quite smooth. The flagellum is poorly developed, with the peduncle very narrow and not nearly attaining the length of the scale, the terminal part being somewhat shorter than the peduncle, and composed of sixteen to eighteen short articulations.

The anterior lip (fig. 4) exhibits the usual galeate form, with the lateral angles, however, but slightly produced.

The posterior lip (fig. 5) has the terminal lobes somewhat expanded and triangular in form, exhibiting exteriorly a distinct and nearly right angle.

The mandibles (fig. 6) exhibit, as to the form of the body, a perfectly normal appearance, the cutting edges (fig. 7) being divided into several sharply pointed teeth. The palp, on the other hand (figs. 6, 8), is remarkably small, not even attaining half the length of the body of the mandible. It is, moreover, very narrow, and but sparingly furnished with bristles, with the terminal joint exceedingly minute and lamelliform.

The first pair of maxillæ (fig. 9) are, on the whole, developed in the usual manner. The terminal joint is rather narrow, and bears at the apex a double series of unequal bristles, some of which are very slender. The exognath is comparatively much smaller than in the genus *Thysanoëssa*, and forms an oval lamella, fringed along the anterior part with a dense row of ciliated bristles.

The second pair of maxillæ (fig. 10) exhibit a somewhat more deviating appearance, having the masticatory lobes remarkably broad and arcuate at the edges, with the hinder one not subdivided by a distinct indentation. The terminal joint, or palp, is exceedingly small, lamelliform, and somewhat constricted at the base, its apex being obtusely truncate and edged round with slender setæ. The exognath, finally, is rather small, forming merely a slight expansion of the outer edge of the basal part, but exhibiting the usual fringe of ciliated bristles.

The maxillipeds (fig. 11) are rather slender and pediform, reaching, when fully extended, almost to the middle of the antennal scale. Of the joints the meral and ischial are nearly equal in length, the latter, however, being much more expanded and almost lamellar. The terminal joint (fig. 12) is somewhat compressed, and exhibits along the inner edge a dense row of comparatively short, ciliated bristles. The exopodite does not differ in size and structure from the true exopods of the legs. Of an epipodite no trace can be detected.

The first pair of legs (fig. 13) are very remarkable, both as regards their great length and slender aspect, and their very peculiar structure. When fully extended, they exceed in length even the whole body; but, as a rule, they are found to exhibit, as in *Thysanoëssa*, a sharp geniculate bend between the meral and carpal joints, the terminal section being reflexed at a more or less acute angle. The proximal part of the leg, comprising the coxal, basal, and ischial joints, appears rather strong and muscular, exhibiting along the inner edge a row of very small bristles. The remaining part, on the other hand, is extremely slender, indeed almost filiform, also very brittle and therefore easily broken off if the specimens be not handled with the greatest care. This part, moreover, lacks every trace of marginal bristles, being quite naked throughout, save at the apex, where a dense assemblage of peculiar spines springs forth in the form of a brush. Of the joints, the meral is much the longest, reaching far beyond the tip of the antennulæ, and being very movably jointed to the ischial, exhibiting a peculiar curve at its base. The carpal and propodal joints are likewise very slender, the former being a trifle longer than the latter, whereas the terminal joint is exceedingly minute, and firmly connected, it would seem, with the preceding. It bears (fig. 14) six slender, straight spines, which, together with two similar ones originating interiorly from the end of the preceding joint, constitute the above mentioned peculiar apical brush. The spines, when highly magnified, present a very curious appearance, being, as it were, annulated at regular intervals, and jutting out at each annular segment as a recurved denticle, thus giving to one of the edges a

densely serrate aspect. What the real function of this peculiarly modified pair of legs is, I am wholly unable to state. Meanwhile, we have every reason to assume that so remarkable a structure cannot but stand in close connection with some unknown requirement bearing on the vital phenomena of the animal.

The four succeeding pairs of legs (figs. 16–20) are comparatively very short and somewhat clumsy in structure, with the joints slightly compressed and fringed along the inner edge with slender bristles. Of the joints, the ischial and meral are the largest, and nearly equal in length. The terminal part, comprising the three outer joints, is remarkably short, not nearly attaining the length of the meral joint, and exhibits several strong spiniform bristles, six to eight of which issue from the very small terminal joint (fig. 17).

The penultimate pair of legs (figs. 21, 22) are exceedingly small, and almost hidden between the gills, but have both the endopod and exopod distinctly defined. The former consists, as in *Thysanöessa*, of only two joints, the terminal the longer, both with a few scattered bristles along their inner edge.

The last pair of legs (fig. 22, 23) are quite rudimentary, each forming merely a small laminar plate, originating from a short basal part. This plate, which undoubtedly represents the exopod, is somewhat unlike that in *Thysanoëssa*, being rather expanded and broadly truncate at the apex, which, together with the inner edge, is fringed with a dense row of ciliated bristles.

The gills are rather fully developed, forming a broad fringe beneath the carapace along the sides of the trunk (see Pl. XXIII. fig. 10), and, as usual, increasing successively in size from before backwards. The two anterior pairs (Pl. XXIV. figs. 13, 16, 24) exhibit much the same appearance as in *Thysanoëssa*, constituting, as they do, single stems, expanded at the apex into two recurving corners, and with a regular series of digitiform gill-lobules along the posterior edge. The four succeeding pairs (figs. 25–28), on the other hand, are all of them double, or exhibit two distinctly defined stems, the outer of which corresponds perfectly in structure with the two anterior pairs of gills, whereas the inner stem is bent inward, exhibiting a somewhat pyramidal form, and furnished at both edges with a clustering assemblage of gill-lobules. This stem, too, is not, as in *Thysanoëssa*, connected with the outer one, but would seem to spring separately from the coxal joint of the leg, becoming, as usual, gradually more complex posteriorly. The last pair of gills (fig. 29) are very large and complex in structure, consisting of two principal portions that point in opposite directions, both, but especially the outer one, being richly arborescent.

The pleopoda of the female do not exhibit any marked peculiarities; those of the male I had no opportunity of examining, the collection containing female specimens only.

The telson (see fig. 30) is very slender and elongate, attaining nearly the length of

the two preceding segments taken together. It tapers toward the apex, produced as an acute point. The subapical spines are of moderate size and smooth. Moreover, two pairs of small denticles occur on the dorsal face of the telson.

The uropoda (see fig. 30) have both plates very narrow, the inner one being appreciably longer than the outer, and projecting beyond the tip of the telson.

The luminous globules agree perfectly, both in number and arrangement, with those in *Euphausia*.

Habitat.—The collection contains comparatively numerous specimens of this interesting species, the greater part having been taken from the surface of the sea at two adjacent Stations of the South Atlantic. The species also occurred in two other localities, but much less abundantly. The localities are the following:—

Date.	Locality.
May 21, 1873.	North Atlantic, off Nova Scotia.
March 9, 1876.	South Atlantic (Station 331).
March 10, 1876.	South Atlantic (Station 332).
March 13, 1876.	South Atlantic (Station 333).

The distribution of the species therefore, as yet known, would appear to be restricted to the Atlantic Ocean.

34. *Nematoscelis microps*, G. O. Sars (Pl. XXV. figs. 1–4).

Nematoscelis microps, G. O. Sars, Preliminary Notices on the Challenger Shizopoda, No. 32.

Specific Characters.—Body somewhat more slender than in the preceding species. Carapace without any lateral denticles, anterior part very slightly keeled above, rostral projection straight, acute, flattened at base. Caudal segments smooth above. Eyes much smaller than in *Nematoscelis megalops*, cornea narrowed in the upper part. Antennal scale projecting but slightly beyond second joint of antennular peduncle, less narrow than in preceding species, apex obtusely rounded. First pair of legs, when fully extended, shorter than body, propodal joint longer than carpal, terminal joint oblong, constricted at base, with about six spines, one of which is much longer than the others. Telson and uropoda nearly as in *Nematoscelis megalops*. Length 16 mm.

Remarks.—This species may be readily distinguished from the preceding by the much smaller eyes, the less elongate first pair of legs, and the form of the rostral projection. It is, moreover, rather inferior in size, and also a trifle more slender.

Description.—Only three female specimens of this form were taken during the Expedition, the largest having a length of 16 mm.

The form of the body (see Pl. XXV. fig. 1), as compared with that of the preceding species, appears somewhat more slender, and less dilated anteriorly.

The carapace lacks, as in that species, every trace of lateral denticles, and is somewhat more elongate in proportion to its height. The anterior part is very slightly keeled above, and juts out as an acute rostral projection, reaching beyond the middle of the basal joint of the antennulæ. This projection, too, is quite straight, with the basal part rather broad and flattened. The antero-lateral corners of the carapace are not nearly produced to the same extent as in *Nematoscelis megalops*.

The caudal segments are perfectly smooth above, none of them being keeled as in the preceding species. The epimera are comparatively small and evenly rounded. The last segment is rather elongate, and exhibits a very small simple preanal spine.

The eyes (see fig. 2) are not nearly so largely developed as in the last species, being comparatively small, with the cornea somewhat narrowed in its upper part.

The antennular peduncle (*ibid.*) exhibits a structure closely resembling that in *Nematoscelis megalops*, but having the two outer joints a trifle more elongate.

The antennal scale (*ibid.*) does not nearly reach the tip of the antennular peduncle, and would seem on the whole to be apparently less slender than in the last species, with the apex obtusely rounded and the outer corner but slightly projecting.

The first pair of legs (see fig. 1) are rather slender and elongate, though not nearly to the same extent as in the last species, being, when fully extended, somewhat shorter than the body. Of the joints the meral, as in that species, is by far the longest, reaching a little beyond the tip of the antennular peduncle. The relation in size between the two succeeding joints is, on the other hand, somewhat different from that in *Nematoscelis megalops*, the propodal joint being the longer of the two. Finally, the terminal joint (fig. 3), though comparatively small, is somewhat more fully developed than in the above-mentioned species, and also, it would seem, very movably connected with the preceding joint. It exhibits an oblong form, being slightly dilated in the middle and constricted at the base, and has six very unequal spines, one of which is very large and strong, projecting far beyond the rest. No spines arise, as in *Nematoscelis megalops*, from the end of the preceding joint.

The succeeding pairs of legs, as also the gills and the pleopoda, would seem to agree in all respects with those of *Nematoscelis megalops*.

The telson (see fig. 4) appears somewhat less elongate than in that species, exhibiting, however, for the rest, a very similar aspect.

The uropoda (*ibid.*) have the inner plate somewhat longer than the outer, projecting however but very little, if at all, beyond the tip of the telson.

One of the specimens, mounted in Canada balsam on a glass slide, is ovigerous. The ova, which are rather numerous, lie enclosed within a single oblong ovisac, extending beneath the trunk, almost throughout the whole of its length (see fig. 1).

Habitat.—The three specimens in the collection were taken at the surface of the sea in the two following localities :—

Date.	Locality.
?	Pacific, north of the Sandwich Islands.
April 29, 1876.	North Atlantic.

In the year 1876 I took a few specimens of the same species in the Mediterranean at Messina.

Hence it would seem to have a rather extensive distribution, the above-mentioned localities lying in widely distant tracts of the ocean.

35. *Nematocelis tenella*, G. O. Sars (Pl. XXV. figs. 5, 7).

Nematoscelis tenella, G. O. Sars, Preliminary Notices on the Challenger Schiopoda, No. 33.

Specific Characters.—Form of body very slender and elongate. Carapace with a well marked, though small, lateral denticle behind the middle of the inferior margin ; anterior part slightly keeled above ; rostral projection rather narrow, straight, acuminate. Caudal segments smooth above, with very small rounded epimera. Last segment rather elongate, preanal spine exceedingly minute. Eyes not very large, subclavate, cornea comparatively small and narrow. Antennular peduncle slender and elongate. Antennal scale not projecting beyond second joint of antennular peduncle, very narrow, linear, apex obtusely truncate. First pair of legs, when fully extended, much shorter than body, meral joint scarcely projecting beyond antennular peduncle, propodal joint longer than carpal, terminal joint sublinear, with only four spines. Gills comparatively simple in structure, with short papillar lobules. Length 10 mm.

Remarks.—The specimens of this form, contained in the collection, have much the appearance of immature animals, but will not, in my judgment, admit of being referred to either of the two species described above, since the carapace has in all of them a well-marked lateral denticle, totally absent in the former. Moreover, several other characters would seem to warrant the specific difference of the present form.

Description.—None of the specimens exceed a length of 10 mm., and all have the appearance of being females.

The form of the body (see Pl. XXV. fig. 5) is exceedingly slender and elongate, nearly cylindrical throughout.

The carapace exhibits a form rather similar to that in *Nematoscelis microps*, but differs in having on either side a well-marked, though somewhat small, lateral denticle,

arising from the inferior margin behind the middle, or, more precisely, just above the point of insertion of the penultimate pair of legs. Its anterior part has a distinct, though not very prominent keel running along the middle, and juts out as a rather narrow and somewhat flattened rostral projection, reaching about the middle of the basal joint of the antennulæ.

The caudal segments are perfectly smooth above, and very narrow, with exceedingly small, rounded epimera. The last segment is appreciably longer than any of the preceding, and has a very small, simple preanal spine.

The eyes (see figs. 5, 6) are not very large, and of a somewhat clavate form, with the cornea very narrow, and occupying but a small part of each eye.

The antennular peduncle (*ibid.*) is very slender and elongate, attaining almost the length of the carapace. The flagella, on the other hand, are exceedingly short, scarcely exceeding half the length of the peduncle.

The antennal scale (see fig. 6) does not reach beyond the second joint of the antennular peduncle, and is very narrow, linear, with the apex obtusely truncate, and the outer corner but slightly projecting.

The first pair of legs (see fig. 5) are comparatively shorter than in either of the two preceding species, and do not nearly attain the length of the body, when fully extended. The geniculate bend between the meral and carpal joints extends to about the tip of the antennular peduncle. The propodal joint, as in *Nematoscelis microps*, is slightly longer than the carpal, and the terminal joint is very narrow, almost linear, and provided with only four slender spines, one of which projects far beyond the rest.

The succeeding pairs of legs are very small, and difficult to examine without dissection.

The gills are apparently far less complex in structure than the corresponding parts in the two preceding species, the gill-lobules being few in number and merely papillar in form.

The caudal fan does not exhibit any essential difference from that in *Nematoscelis microps*.

Habitat.—A few specimens of this slender species have been collected at the surface of the sea, in five different localities :—

Date.	Locality.
December 19, 1873.	South of the Cape of Good Hope.
October 27, 1874.	Samboangan to Ilo Ilo, Philippines.
October 1874.	Off Mindanao, Philippines.
April 9, 1876.	Tropical Atlantic.
April 13, 1876.	Tropical Atlantic, off the coast of Africa.

The distribution of the species would accordingly seem to range from the tropical part of the Atlantic to the tract of ocean surrounding the Indian Archipelago.

36. *Nematoscelis rostrata*, G. O. Sars (Pl. XXV. figs. 8–10).

Nematoscelis rostrata, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 34.

Specific Characters.—Form of body much shorter and stouter than in the last species. Carapace with a very strong lateral denticle at posterior part of inferior margin, and a conspicuous rounded crest above anterior to the middle; rostrum greatly produced, reaching almost to the end of the basal joint of the antennulæ, straight, acuminate, broad and flattened at the base. Caudal segments smooth above, with small rounded epimera. Eyes rather large, irregularly pyriform, cornea narrowed in upper part. Antennal scale comparatively small, reaching scarcely to the end of the second joint of the antennular peduncle. First pair of legs shorter than in the other species, meral joint reaching hardly to tip of antennular peduncle, propodal joint longer than carpal, terminal joint slightly dilating toward the tip, with five spines. Gills and caudal fan as in *Nematoscelis tenella*. Length 8 mm.

Remarks.—This form also, it would seem, is represented in the collection only by immature specimens. I have nevertheless felt warranted in establishing a new species for their reception, differing, as they do, in several respects distinctly from any of the preceding species. Thus, the body is comparatively much shorter, the rostrum more produced; and besides, the strongly developed lateral denticle of the carapace, as also the conspicuous dorsal crest, would seem to afford well-marked specific characters.

Description.—The length of the specimens in the collection does not exceed 8 mm., and therefore this form must be regarded as one of the smallest Euphausidians. All the specimens are females.

The form of the body (see Pl. XXV. fig. 8), as compared with that of *Nematoscelis tenella*, is much shorter and more thickset, as also somewhat compressed.

The carapace is comparatively short in proportion to its height, and has on either side a very strong lateral denticle, jutting out from the hinder part of the inferior margins about where that corresponding to it projects in *Nematoscelis tenella*. On the dorsal face, moreover, a very conspicuous rounded crest occurs at some distance in front of the middle, disappearing before it reaches the base of the rostrum. The latter is greatly produced, extending far beyond the middle of the basal joint of the antennulæ, and is quite straight, ending in a sharp point. Viewed from above (fig. 9), the rostrum appears broad and flattened at the base, tapering gradually toward the extremity.

The caudal segments are smooth above and appreciably broader than in the last species, the epimera, however, being very small. The last segment is longer than the preceding, and has a very small simple preanal spine.

The eyes (see figs. 8, 9) are comparatively large, irregularly pyriform, and slightly flattened, with the cornea oblong in form and somewhat narrowed in its upper part.

The antennular peduncle (*ibid.*) appears a trifle less elongate than in *Nematoscelis tenella*, for the rest exhibiting a very similar structure.

The antennal scale (see fig. 9) does not quite reach to the end of the second joint of the antennular peduncle, and would seem to be a trifle broader than in the last species.

The first pair of legs (see fig. 8) are comparatively shorter than in any of the preceding species, but in other respects resemble those in *Nematoscelis tenella*. The terminal joint expands gradually toward the apex, which is abruptly truncate, and provided with five spines, one of which projects appreciably beyond the rest.

The gills exhibit much the same simple appearance as in the last species.

The caudal fan, likewise, would not seem to exhibit any essential difference in its structure from that in *Nematoscelis tenella*.

Habitat.—Several specimens of this form were collected during the Expedition, but the greater part are more or less defective. All were taken in the tow-net. The localities are the following :—

Date.	Locality.
August 27, 1873.	Tropical Atlantic, off St. Paul's Rocks.
August to September 1875.	Pacific.
February 1875.	Pacific, north of New Guinea.
March 3, 1876.	South Atlantic.
March 31, 1876.	South Atlantic.
April 6, 1876.	Tropical Atlantic.
April 9, 1876.	Tropical Atlantic.
April 13, 1876.	Tropical Atlantic, off the coast of Africa.
May 3, 1876.	North Atlantic.
May 12, 1876.	North Atlantic.

As regards distribution, it would appear from the above given localities, that the species is met with throughout the whole of the Atlantic, occurring also in the Pacific.

Genus 7. *Stylocheiron*, G. O. Sars, 1883.

Stylocheiron, G. O. Sars, Preliminary Notices on the Challenger Schizopoda.

Generic Characters.—Form of body somewhat varying in the different species. Eyes more or less irregularly formed. Flagella of the two pairs of antennæ very slender, with few and elongate articulations. Mandibles without palp. First pair of maxillæ wanting exognath; second pair small, with indistinctly defined masticatory lobes, fringed with but a single row of slender setæ. Maxillipeds feeble in structure, with greatly developed exopodite, but wanting epipodite. Legs rather dissimilar; first pair of same appearance as maxillipeds; second pair greatly produced, geniculate, meral and carpal joints very elongate and slender, naked, propodal joint somewhat swollen, and armed with strong spiniform bristles impinging against the curved spines arising from terminal joint, the

two forming together a kind of grasping organ. Succeeding legs much smaller and rapidly diminishing in length, the two anterior pairs with proximal part much compressed, laminar; antepenultimate pair with endopod bi-articulate; last pair quite rudimentary, forming each merely a small setiferous lamella. Gills rather simple in structure, last pair largest. Ovisac single. Only three luminous globules present, one ventral belonging to the first caudal segment, and two lateral at the bases of the penultimate pair of legs, the latter in the male very fully developed and supplied with an additional lens.

Remarks.—This is a very distinct genus, and characterised most prominently by the strong and peculiar development of the second pair of legs, which are modified so as to form grasping organs. Moreover, it differs in several other respects, as will be seen from the above diagnosis, not a little from other Euphausiidæ, though exhibiting perhaps a certain affinity to the genus *Nematoscelis*.

Five different species of this remarkable genus are represented in the Challenger collection. All of these are comparatively very small, but undoubtedly cannot be regarded as larval stages, since in one of the species at least, both ovigerous females and adult males have been observed. This genus I had previously met with, having observed one of its species in the Mediterranean, at Messina, in the year 1876.

The following is a synopsis of the species:—

- Carapace
  - distinctly carinate above, with a conspicuous rounded crest anterior to the middle. Rostrum very narrow, acute. Eyes large, with cornea narrowed in upper part, ... — *S. carinatum*, G. O. Sars.
  - but slightly keeled above in anterior part. Eyes
    - comparatively small, with cornea very much narrowed in upper part. Rostrum acute, . — *S. suhmii*, G. O. Sars.
    - rather large, compressed, with cornea narrow, oblong. Last caudal segment
      - not longer than preceding. Rostrum acutely produced, . — *S. longicorne*, G. O. Sars.
      - exceedingly elongate and slender. Rostrum very short, . — *S. elongatum*, G. O. Sars.
  - remarkably short, with rather produced rostrum. Eyes exceedingly large and thick. Outer part of second pair of legs forming a complete chela, ... — *S. abbreviatum*, G. O. Sars.

37. *Stylocheiron carinatum*, G. O. Sars (Pl. XXVI.).

Stylocheiron carinatum, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 35.

Specific Characters.—Form of body rather thickset in male, somewhat more slender in female. Carapace short in proportion to height, distinctly carinated above, and forming an elevated crest behind base of rostrum: the latter very narrow and acutely produced. Last caudal segment longer than preceding. Eyes large, irregularly

pyriform, cornea narrowed in upper part. Antennular peduncle shorter than carapace, the two outer joints subequal, very slender in female, but strongly dilated in male. Antennal scale projecting scarcely beyond second joint of antennular peduncle, oblong, apex obliquely truncate. Second pair of legs, when fully extended, not attaining length of body, carpal joint shorter than meral, and near the apex bearing a curved spine, propodal joint with three strong ciliate bristles at inner edge; terminal joint very small, with apical spines subequal. Inner plate of uropoda longer than outer. Length 11 mm.

Remarks.—Of this species I have had an opportunity of examining several specimens, both adult females and males, whereas the other species are represented in the collection merely by solitary specimens. Hence, the generic characters have been chiefly based upon an anatomical investigation of the present form, which accordingly may be regarded as the type of the genus.

Description.—The length of the largest female specimen measures 11 mm. The males are, as a rule, a trifle smaller.

The form of the body is somewhat more slender in the females (Pl. XXVI. fig. 1) than in the males (fig. 19), but in both it would appear, on the whole, to be rather thick-set.

The carapace is somewhat short in proportion to its height, more especially in the males, and lacks every trace of lateral denticles. Above it is distinctly carinate throughout a great part of its length, the carina forming anteriorly an elevated crest which ends abruptly at some distance behind the base of the rostrum. The latter is very narrow, perfectly straight, and projects beyond the middle of the basal joint of the antennulæ, its apex being sharply pointed. The antero-lateral corners of the carapace are produced at an acute angle.

The caudal segments are smooth above, and furnished with comparatively small rounded epimera. The last segment is rather elongate, about as long as the two preceding segments taken together, and exhibits a very small, unguiform preanal spine.

The eyes are rather large, more especially in the male, irregularly pyriform, with the cornea considerably expanded below and somewhat narrowed in its upper part.

The antennular peduncle in the female (fig. 3) is rather slender and elongate, though a trifle shorter than the carapace, and exhibits a structure much resembling that in the genus *Nematoscelis*, the basal joint being considerably flattened, whereas the two outer joints are very narrow, cylindrical, subequal, and, taken together, somewhat longer than the basal. Of the flagella, the outer part was broken off in all the specimens, but to judge from the still remaining basal part, they would seem to have been extremely slender, with narrow and elongate articulations. In the male, the antennular peduncle (fig. 21) has a much more powerful development, the two outer joints being greatly dilated, and, taken together, somewhat shorter than the basal. Of the flagella, only the basal parts remain, but, to judge from what is left, they must probably likewise have been rather

more powerful than in the female. The outer flagellum more especially is distinguished by a very thick, and, as it were, swollen base.

The antennal scale (fig. 4) projects but slightly beyond the second joint of the antennular peduncle, and exhibits a regular oblong-linear form, its length being about four times greater than its breadth. The apex is obliquely truncate, with the inner corner projecting, the outer jutting out as a small denticle. Of the flagellum, here too the outer part was broken off in all the specimens; its peduncle is exceedingly slender and projects far beyond the scale, with the middle joint very elongate, nearly three times as long as the terminal.

The anterior lip (see fig. 5) exhibits the usual galeate form, but would seem to be relatively somewhat smaller than in other Euphausiidæ.

The posterior lip (fig. 6) has the terminal lobes somewhat rounded, without a distinctly marked outer angle.

The mandibles (see fig. 5) are eminently distinguished by the total absence of the palp. Their masticatory parts (fig. 7) appear a trifle less strongly expanded than in most other Euphausiidæ, but with the cutting edges divided in the usual manner into several acute teeth, having likewise posteriorly a well-marked molar protuberance.

The first pair of maxillæ (fig. 8) do not exhibit any trace of the usual lamellar exognath, but for the rest would seem to be of normal appearance, except that both of the masticatory lobes have a comparatively small number of setæ and spines. The terminal joint is lamelliform, oval, and, as usual, provided along the inner edge with a double row of bristles.

The second pair of maxillæ (fig. 9) are rather small and membranous throughout, exhibiting, on the whole, a less perfect development than in other Euphausiidæ. The masticatory lobes are only two in number and project but very little, forming merely slight expansions of the inner edge of the basal part, fringed with a single row of slender ciliated bristles. Of the lobes, the inner one is by far the shorter, and has only five bristles. The terminal joint is very short, appearing as a mere direct continuation of the basal part, though separated by a distinct transverse suture; it is furnished with three bristles only, springing from the inner edge. The exognath forms a slight expansion of the outer edge of the basal part, and is fringed with about nine plumose setæ, increasing in length anteriorly.

The maxillipeds (fig. 10) have the stem, or endopodite, comparatively small, reaching but very little beyond the basal part of the antennæ, and rapidly tapering toward the apex, the outer part being very slender. The masticatory process, issuing from the coxal joint, is conically produced, and bears at the tip three diverging setæ. The basal joint is rather broad and compressed, and also the ischial joint is decidedly laminar, though considerably narrower, both furnished along the inner edge with very short bristles. The meral joint is somewhat longer than the ischial, but very much narrower, and has like-

wise a row of delicate bristles along the inner edge. The terminal part of the maxilliped, comprising the three outer joints, is extremely slender, and about equals in length the meral joint. Of its joints, the middle one is the longest, whereas the last (fig. 11) is exceedingly small and truncate, bearing at the tip four ciliated bristles. The exopodite (see fig. 10) is remarkably large, projecting even beyond the tip of the endopodite, with the basal part very elongate and muscular. The epipodite is wholly wanting.

The first pair of legs, which in the two preceding genera are the ones peculiarly modified, are in the present genus of exactly the same structure as the maxillipeds, save their being a trifle more elongate, with the masticatory process obsolete and the exopod somewhat shorter.

The second pair of legs (fig. 22), on the other hand, are developed in a very peculiar manner, being altogether dissimilar to any of the others. They are very elongate and slender, also strongly geniculate, recalling to a certain extent the structure characteristic of the first pair in the genus *Nematoscelis*, but differing materially in the deviating form of the two last joints. In the female (fig. 1) they are somewhat more elongate than in the male, about equalling, when fully extended, the posterior division of the body in length; but in other respects they fully agree in both sexes. Of the joints, the meral and carpal are exceedingly produced and very movably connected, the former being by far the longer. The carpal joint exhibits at the end a slight projection of the inner edge, bearing a short curved spine; but for the rest both these joints are perfectly smooth. The propodal joint is much shorter than the carpal, attaining scarcely half its length, but appears somewhat thicker, and, as it were, swollen, as also provided at both edges with three strong spiniform bristles, those of the inner edge being by far the longer. The terminal joint, finally, is very small, and bears five similar bristles, curving in a direction opposite to that taken by those on the inner edge of the preceding joint. Thus both these outer joints form together, as it were, a kind of grasping hand, though not so decidedly prehensile in this as in the other species of the genus.

The two succeeding pairs of legs (figs. 12, 13) differ very considerably in appearance both from the first and second pairs. They are somewhat short, with the proximal part of the endopod strongly appressed and laminar, as also gradually tapering toward the tip of the meral joint. The ischial joint in both pairs is much the largest, being several times longer than the meral; both have a few slender bristles along the inner edge. The terminal part is distinctly tri-articulate in the third pair (fig. 12), and somewhat longer than the meral joint, whereas in the fourth pair (fig. 13) this part is exceedingly small and only bi-articulate.

The fifth or antepenultimate pair of legs (fig. 14) present an aspect, not agreeing with any of the preceding pairs. They are rather small and have the endopod consisting of only three joints, the first much the largest, somewhat curved, and provided along the inner edge with a row of eight strong ciliated setæ. The succeeding (meral) joint has on

either side, near the extremity, a very slender, non-ciliated bristle. Finally, the last joint, representing the terminal part in the preceding legs, is exceedingly narrow, and bears four similar bristles, one of which issues from the outer edge, the other three from the tip; one of the latter is extremely elongate.

The penultimate pair of legs (fig. 15) are still smaller and simpler in structure, with the endopod consisting of only two joints of almost equal size, the terminal one somewhat curved, and provided at the tip with four remarkably long and slender, non-ciliated bristles. The exopod in this as well as the preceding pair is very small, though with both its sections well defined.

The last pair of legs (figs. 16, 17) are quite rudimentary, each forming merely an ovoid, setiferous lamella (exopod), originating from a short basal part connected with the corresponding gill-stem.

The gills (see fig. 2) exhibit on the whole a rather simple structure, all, except the last pair, forming single stems, more or less expanding at the tip, and bearing a regular series of digitiform gill-lobules. On the two first pairs two such lobules only are present: on the succeeding pairs the number gradually increases from four to eight. The last pair (figs. 2, 16, 24) are somewhat more complex, exhibiting the two usual divisions, the outer of which is the larger, and bears three or four secondary gill-branches.

The pleopoda in the female exhibit the usual structure. In the male, the two anterior pairs are slightly modified, the inner plate having a sexual or copulatory appendage. On the first pair, this appendage (figs. 25, 26) consists apparently of two portions, the outer bearing at the tip two rather short and somewhat hamate processes, together with a short curved spine, the inner portion simple lobular. On the second pair, the appendage (fig. 27) is comparatively large, projecting far beyond the principal plate, and exhibits at the somewhat dilated extremity several twisted lobes.

The telson (see fig. 18) has the usual slender form, tapering towards the apex, which terminates in a sharp point. The subapical spines are not very large, projecting but slightly beyond the tip of the telson, and perfectly smooth. Furthermore, two pairs of small denticles occur on the dorsal face of the telson.

The uropoda (*ibid.*) are likewise quite normal in structure, having the inner plate somewhat longer than the outer, and reaching nearly to the tip of the telson.

The luminous apparatus, so uniformly developed in most other Euphausiidæ, exhibits in this genus certain well-marked peculiarities. Thus the globules are considerably reduced in number, only three of them being developed, viz., one odd one between the bases of the first pair of pleopoda, and a pair of lateral globules at the bases of the penultimate pair of legs (see figs. 1, 19). On the other hand, the latter globules attain in the male (figs. 20, 23) an extraordinary development, being more than twice as large as those in the female. Moreover, a supplementary lens, formed, it would seem, by a thickening of the outer integument, is subjoined at some distance from the globule, and

in such a position as to admit of the front part of the globule being brought precisely in the same axis. Thus, no doubt, a much more complete condensation of light may be effected than could possibly result from the action of the globule alone. Within the ocular pedicle occurs, moreover, in both sexes, a luminous organ, similar in structure to the one described above in *Euphausia* (see fig. 1).

Of the female specimens in the collection, two were ovigerous. The ova are (see fig. 1) very large, and of course few in number, as also contained within a common sacular envelop, oblong and somewhat flattened, and extending beneath the greater part of the trunk. The peculiar slender, non-ciliated bristles issuing from the endopods of the antepenultimate and penultimate pairs of legs in the female, serve most probably for affixing the ovisac and keeping it *in situ*.

Habitat.—The specimens in the collection were all taken by the tow-net, in the following localities :—

Date.	Locality.
August 11 to 12, 1874.	Pacific, off Kandavu, Fiji Islands.
October 1874.	Off Mindanao, Philippine Islands.
February 1875.	North Pacific.
March 21, 1876.	South Atlantic.

The range of the species would accordingly seem to be rather extensive, comprising, as it does, the South Atlantic and Pacific Oceans, as also the Celebes Sea.

38. *Stylocheiron suhmii*, G. O. Sars (Pl. XXVII. figs. 1–4).

Stylocheiron suhmii, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 36.

Specific Characters.—Form of body rather short. Carapace larger than in last species, without any distinct dorsal crest, rostral projection triangular, acute. Last caudal segment scarcely longer than preceding. Eyes smaller than in *Stylocheiron carinatum*, cornea much narrowed in upper part. Antennular peduncle in female exceedingly slender, equalling carapace in length, last joint longer than second. Antennal scale projecting considerably beyond second joint of antennular peduncle, very narrow, linear, apex obliquely truncate. Second pair of legs almost as long as the body, carpal and meral joints subequal, propodal joint with three slender spines at end of inner edge, terminal joint produced as a strong unguiform spine and with two shorter spines springing from either side. Uropoda shorter than telson, terminal plates subequal. Length 8 mm.

Remarks.—Among the drawings executed by the late Dr. v. Willemoes-Suhm during the Expedition, there is one representing this form, and as the species, therefore, may be

said to have been discovered by that lamented naturalist, I have deemed it advisable to associate his name with this form, although he was clearly misled in regarding it as a male *Euphausia*. The species may be at once distinguished from *Stylocheiron carinatum* by the more elongate carapace, lacking, as it does, any distinct dorsal crest, by the much smaller eyes, the very slender antennulæ, and a somewhat different structure of the second pair of legs.

Description.—Only three specimens of this form are in the collection, the largest of which, a female, measures 8 mm. in length. The latter, apparently the same specimen examined by the late Dr. v. Willemoes-Suhm, has been treated with carmine and mounted in Canada balsam on a glass slide. The two other specimens, one of which was a male, were more or less defective, and also of smaller size.

The form of the body (see Pl. XXVII. fig. 1) is rather short, and exhibits between the anterior and posterior divisions a proportion somewhat different from that in the preceding species, the tail being relatively far less elongate.

The carapace appears comparatively larger than in *Stylocheiron carinatum*, as also somewhat narrowed anteriorly, and without any distinct crest, being but very slightly keeled along the middle of the anterior part. The rostral projection is shorter, and flattened at the base, terminating in a sharp point, that does not nearly reach to the middle of the basal joint of the antennulæ.

The caudal segments rapidly diminish in height and breadth posteriorly, and are furnished with distinct, though not very large, rounded epimera. The last segment is comparatively short, very little, if at all, longer than the preceding, and would seem to lack the preanal spine.

The eyes (see fig. 1), as in *Stylocheiron carinatum*, are irregularly pyriform, but relatively much smaller, with the cornea exceedingly narrowed in its upper part, forming here (see fig. 4), as it were, a mammillar projection containing a number of densely crowded visual elements.

The antennular peduncle, in the female (see fig. 1), is remarkably elongate and slender, almost equalling the carapace in length, and has the last joint somewhat longer than the second. In the male this part (fig. 4) is relatively less slender, with the outer joints subequal and cylindrical in form. Of the flagella the inner one only is complete in the female specimen; it has nearly the length of the peduncle, and is very slender, with six rather elongate articulations.

The antennal scale (fig. 2) is rather elongate, projecting considerably beyond the second joint of the antennular peduncle, and, in the male (fig. 4), reaching nearly to the tip of the peduncle. It is exceedingly narrow, linear, though slightly expanding toward the apex, which is very obliquely truncate, with the inner corner greatly projecting and the outer having a well-defined tooth. The flagellum is remarkably elongate and slender, exceeding even the length of the body, and has the peduncle extending far

beyond the tip of the scale; the terminal part is composed of about five very long and slender articulations.

The second pair of legs (see fig. 1), when fully extended, almost equal in length the whole body, and have the meral and carpal joints nearly equal. The propodal joint is, as usual, somewhat thickened, and bears at the end of the inner edge three slender, non-ciliated spines. The terminal joint is conically tapering, and juts out as a strong unguiform spine, having also, on either side, two other somewhat shorter ones.

The telson would not seem to exhibit any essential difference from that in the preceding species.

The uropoda, on the other hand, would appear to be relatively shorter, not nearly reaching to the tip of the telson, and with both plates about equal in length.

Habitat.—The three specimens of this form in the collection were taken at the surface of the sea, in the following localities:—

Date.	Locality.
October 27, 1874.	Samboangan to Ilo Ilo, Philippines.
January 9, 1875.	Off Luzon, China Sea.
March 1, 1875.	Pacific, north of New Guinea.

The distribution of the species, as yet known, would accordingly seem to be confined to the western part of the Pacific and the sea surrounding the Philippine Islands.

39. *Stylocheiron longicorne*, G. O. Sars (Pl. XXVII. fig. 5).

Stylocheiron longicorne, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 37.

Specific Characters.—Form of body a little more slender than in the last species. Carapace very slightly keeled above in anterior part; rostral projection shorter than in *Stylocheiron suhmii*, acute. Last caudal segment scarcely longer than preceding. Eyes rather large and much compressed, with cornea very narrow, oblong, but slightly contracted in its upper part. Antennular peduncle remarkably slender and elongate, exceeding carapace in length, both flagella also very long and slender. Antennal scale similar in form to that in *Stylocheiron suhmii*; flagellum enormously produced, with extremely elongate articulations. Second pair of legs likewise of unusual length, longer even, when fully extended, than the whole body, carpal and meral joints subequal, and nearly as in *Stylocheiron suhmii*. Uropoda longer than telson, with inner plate scarcely longer than outer. Length 9 mm.

Remarks.—This species is closely allied to *Stylocheiron suhmii*, but can be readily distinguished by the peculiar compressed form of the eyes, as also by the prodigious length of the antennal flagellum and of the second pair of legs.

Description.—One specimen only of this form, a female, is found in the collection, mounted in Canada balsam on a glass slide. The specimen measures in length 9 mm.

The form of the body (see Pl. XXVII. fig. 5) is somewhat short, though perhaps a trifle more slender than in *Stylocheiron suhmii*, the posterior division being rather more elongate in proportion to the anterior.

The carapace appears relatively smaller than in the last species, exhibiting for the rest a very similar form. The anterior part is slightly keeled above, and juts out as a rather short but acute rostral projection.

The caudal segments are, as in the other species, quite smooth above, and provided with well-defined, though not very large, rounded epimera. The last segment is scarcely longer than the preceding, and would seem to lack the preanal spine.

The eyes are considerably larger than in *Stylocheiron suhmii*, and greatly compressed, expanding at the end, with the cornea remarkably narrow, oblong, and but slightly contracted in its upper part.

The antennular peduncle is exceedingly slender and elongate, more so even than in the last species, and appreciably exceeds the carapace in length. The flagella are somewhat longer than the peduncle, and very slender, filiform, both of them five-jointed and equal in length.

The antennal scale reaches a little beyond the second joint of the antennular peduncle, and exhibits a certain resemblance to that in *Stylocheiron suhmii*, though possibly a trifle broader. The flagellum is prodigiously elongate, perhaps several times as long as the body, the peduncle alone having more than twice the length of the carapace, with the outer joint exceedingly narrow and linear.

The second pair of legs exhibit a structure very similar to that in *Stylocheiron suhmii*, but are relatively still more produced, exceeding, when fully stretched, the whole body in length.

The caudal fan would seem to differ from that of the last species in a more elongate form of the uropoda, projecting appreciably, as they do, beyond the tip of the telson. Both of the terminal plates are about equal in length.

Habitat.—The above described specimen was obtained at the surface of the sea, in the following locality :—

Date.	Locality.
December 14, 1873.	South of Cape of Good Hope.

The species also occurs in the Mediterranean, since a few specimens were taken by myself, at Messina, in the year 1876.

40. *Stylocheiron elongatum*, G. O. Sars (Pl. XXVII. figs. 6–10).

Stylocheiron elongatum, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 38.

Specific Characters.—Form of body very slender and elongate. Carapace somewhat gibbous in anterior part; rostral projection very short. Last caudal segment remarkably elongate, exceeding in length the two preceding taken together. Eyes rather large and compressed, cornea oblong, not contracted in upper part. Antennular pedunele nearly as long as carapace, the two outer joints subequal and but slightly dilated in male. Antennal scale rather narrow, apex obliquely tapering to a projecting corner. Second pair of legs rather shorter than body, meral joint longer than carpal, hand nearly as in the two last species. Inner plate of uropoda much longer than outer. Length of adult male 13 mm.

Remarks.—The present species is recognised at once by the very slender form of the body, and, more particularly, the great length of the last caudal segment. Moreover, the deviating form of the antennal scale, as also the comparatively less elongate second pair of legs, afford good specific characters.

Description.—Two specimens only of this distinct form were found in the collection, one an adult male, the other a young female. The length of the male specimen is 13 mm.

The form of the body (see Pl. XXVII. fig. 6) is more slender and elongate by far than in any of the other species, the tail in particular being greatly produced.

The carapace is comparatively short, measuring in length not more than a third of the tail, and would appear to be somewhat gibbous throughout its anterior part, with a somewhat short and low crest above in the middle. The rostral projection is very short, reaching but slightly beyond the ocular segment. The antero-lateral corners of the carapace are rather produced, and very acute.

The caudal segments taper gradually from before backwards, and are furnished with comparatively small, rounded epimera. The last segment is remarkably elongate and slender, exceeding even the two preceding ones taken together, and would appear to lack the preanal spine.

The eyes are rather large, and expanded toward the apex, but decidedly compressed, with the cornea narrow oblong, and of nearly uniform breadth throughout.

The antennular peduncle in the female specimen is very slender and elongate; that of the male is comparatively more thickset, with the two outer joints somewhat less narrow and about equal in length. The flagella were broken off in both specimens.

The antennal scale (fig. 7) is not very elongate, reaching but slightly (in the male) beyond the second joint of the antennular peduncle, and exhibits a form somewhat dissimilar to that in the other species, being broadest in the middle and tapering gradually towards the apex, which is not truncate, but ends in a projecting corner. The

flagellum was partly broken off in the specimens examined, and in none of them would appear to have had any considerable length.

The second pair of legs (see fig. 6) are relatively much shorter and stouter than in any of the three preceding species, not nearly attaining the length of the body. Of the joints, the meral is appreciably longer than the carpal. The propodal joint (fig. 8) is rather swollen, and has, as in the two preceding species, at the end, interiorly, three curved spines, one of which is very elongate. The terminal joint is conical in form, and bears five spines, three apical and two lateral.

The copulatory appendages of the two first pair of pleopoda in the male (see figs. 9, 10) are rather fully developed, more especially those of the first pair (fig. 9), and exhibit a structure somewhat resembling that in *Stylocheiron carinatum*.

Both the telson and the uropoda appear rather more elongate than in the three preceding species, the inner plate of the uropoda, in particular, being greatly produced, and reaching appreciably beyond the tip of the telson.

The remarkably developed luminous globules occurring at the bases of the penultimate pair of legs are distinctly perceptible in the male specimen (fig. 6) shining through the integument; and, moreover, a supplementary lens may be seen in front of each globule, precisely as in the male of *Stylocheiron carinatum*.

Habitat.—The two above mentioned specimens were taken at the surface of the sea, both in exactly the same locality, along with specimens of *Thysanoëssa gregaria* and *Nematoscelis megalops*; March 1876, South Atlantic.

41. *Stylocheiron abbreviatum*, G. O. Sars (Pl. XXVII. figs. 11–13).

Stylocheiron abbreviatum, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 39.

Specific Characters.—Form of body exceedingly short and thickset. Carapace remarkably shortened, with a slight rounded crest above; rostrum rather large, straight, lanceolate, tip very acute and somewhat deflexed. Last caudal segment longer than preceding. Eyes enormously developed, pedicle very tumid, cornea narrowed in its upper part. Antennular peduncle elongate and slender, the two outer joints subequal. Antennal scale projecting beyond second joint of antennular peduncle, sublinear, apex narrowly truncate, outer corner armed with a very small tooth. Second pair of legs shorter than body, carpal joint only half as long as meral, propodal joint rather elongate, and forming, together with the terminal, a complete chela. Inner plate of uropoda a trifle longer than outer. Length 8 mm.

Remarks.—This species can, at the first glance, be recognised by its very short and thickset body, its enormous eyes, and the peculiar structure of the second pair of legs, the two outer joints of which form together a complete chela.

Description.—Several, but the greater part defective, specimens of this striking form are met with in the collection, the largest of which has a length of 8 mm. All specimens would seem to be females.

The form of the body (see Pl. XXVII. fig. 11) is exceedingly short and thickset, more so perhaps than in any other known species of Euphausiidæ.

The carapace, in particular, is remarkably shortened, almost as high as long, and above has a distinct, though not very elevated, rounded crest. The rostral projection is rather strong, lanceolate, and terminates in a very acute and somewhat deflexed point.

The five anterior caudal segments are somewhat thick, and furnished with comparatively small, rounded epimera. The last segment, on the other hand, is very elongate and tapers toward the apex. Of the preanal spine, no trace whatever could be detected.

The eyes are prodigiously developed, with very thick, and, as it were, swollen pedicles, and the cornea somewhat expanded below but appreciably narrowed in the upper part.

The antennular peduncle is rather elongate, with the two outer joints very slender and about equal in length. Both of the flagella were broken in all the specimens.

The antennal scale (fig. 12) is rather large, reaching to well nigh the middle of the last joint of the antennular peduncle; it exhibits a narrow, linear form, being somewhat curved and narrowly truncate at the apex, with the outer corner projecting as a small denticle. The flagellum is very slender, with its basal part exceedingly narrow and projecting far beyond the tip of the scale, having also the middle joint by far the longest.

The second pair of legs (see fig. 11) do not attain, when fully extended, the length of the body, and have the carpal joint scarcely more than half as long as the meral. The propodal joint, on the other hand, is more produced than in any of the preceding species, attaining well nigh the length of the carpal, and juts out at the end interiorly as a strong unguiform spine. The last joint is digitiform-produced, and terminates in a strong incurved claw, bearing at its base two secondary spines. This joint, too, admits of being impinged against the spine arising from the preceding joint, and thus constitutes with the latter a complete chela, in appearance somewhat resembling that in several Decapods.

The caudal fan does not exhibit any marked peculiarities. The inner plate of the uropoda is, however, somewhat longer than the outer, and projects a little beyond the tip of the telson.

Habitat.—The specimens were taken at the surface of the sea, in the following localities:—

Date.	Locality.
July 1875.	Pacific, north of Sandwich Islands.
April 9, 1876.	Tropical Atlantic.
April 29, 1876.	North Atlantic.

Hence the species would seem to have a rather extensive distribution, ranging, as it does, from the North Atlantic to the Pacific Ocean.

DEVELOPMENT OF EUPHAUSIIDÆ.

In his great work on the Crustacea of the United States Exploring Expedition, Dana has established, exclusive of certain other spurious genera, apparently founded on larval forms of Macrura, the three following schizopodous genera:—*Cyrtopia*, *Furcilia*, and *Calyptopis*. The first of these he ranks among the Euphausiidæ, whereas the two others are described in an Appendix to the Mysidæ together with the spurious genus *Zoëa* (first larval stage of Brachyura). As first shown by Professor Claus,[1] all these three genera represent but different stages in the development of Euphausiidæ, the genus *Calyptopis* being an earlier, the genus *Cyrtopia* a later, and the genus *Furcilia* an intermediate stage. In 1869 Metschnikoff described[2] a still earlier stage in the development of *Euphausia*, and in 1871 the same author stated[3] that the young of *Euphausia* are hatched as true Nauplii, having a rounded, unsegmented body with only three pairs of developed limbs, viz., the two pairs of antennæ and the so-called mandibular legs. Thus not less than five principal stages occur in the larval development of the Euphausiidæ. The two first we shall designate, in accordance with earlier authors, the *Nauplius* stage and the *Metanauplius* stage. For the three succeeding stages I have seen fit to apply the generic denominations suggested by Dana, since none of these stages fully correspond with the *Zoëa* and *Mysis* stages in other Podophthalmia. Hence we have the following successive stages in the development of the Euphausiidæ. The *Nauplius*, *Metanauplius*, *Calyptopis*, *Furcilia*, and *Cyrtopia* stages. The first of these I have not had opportunity of examining, whereas the following will all be found described in detail below, as well as several intermediate or connecting stages.

I append here a short diagnosis of each of the principal stages peculiar to the development of the Euphausiidæ:—

1. *Nauplius Stage.*—Body oval, unsegmented. No compound eyes. Three pairs of

[1] Ueber einige Schizopoden und niedere Malacostraken Messina's. *Zeitschr. f. wiss. Zool.*, 1863.

[2] Ueber ein Larvenstadium von Euphausia. *Zeitschr. f. wiss. Zool.*, Bd. xix.

[3] Ueber den Nauplinszustand der Euphausia. *Zeitschr. f. wiss. Zool.*, Bd. xxi.

limbs only present, the anterior (antennulæ) simple, the two others (antennæ and mandibular legs) biramous, natatory.

2. *Metanauplius Stage.*—Form of body as in the Nauplius stage. Two pairs of limbs (antennulæ and antennæ) only developed; mandibular legs lost. Mandibles, maxillæ, and maxillipeds present merely as bud-like prominences.

3. *Calyptopis Stage.*—Body divided into its two principal divisions. Carapace distinct, forming anteriorly a hood-like expansion. Tail becoming segmented. Compound eyes still imperfectly developed, immobile, and covered over by the carapace. Mandibles, maxillæ, and maxillipeds distinct, but no trace of legs or pleopoda. Uropoda becoming developed.

4. *Furcilia Stage.*—Compound eyes more fully developed, mobile, and projecting beyond the sides of the carapace. Antennæ still retaining their original structure, natatory. Anterior pairs of legs and pleopoda successively developing.

5. *Cyrtopia Stage.*—Antennular flagella becoming elongate and distinctly articulate. Antennæ transformed, so as not to serve the purpose of locomotion. Posterior legs and gills successively appearing.

6. *Post-Larval Stage.*—All the legs developed. Telson assuming its definitive form and armature.

The difficulty attending an accurate reference of the numerous larval forms contained in the Challenger surface gatherings to the several species described above has been very great. However, by carefully examining all the forms, and comparing one with the other, I have nevertheless been enabled to trace out the development, more or less completely, in four different species belonging to as many genera. In the following pages I purpose describing the several stages of each species in detail.

Early Larval Stages of Nyctiphanes australis, G. O. Sars (Pl. XXVIII.).

The larvæ treated of here I have felt warranted in referring to the above-named species, taken, as they were, from precisely the same bottles as the adult specimens of this form, and from localities where no other Euphausiidæ were obtained. Moreover, as stated above, two of the adult females were ovigerous, whence it may be inferred that hatching time was about to commence. From this cause, apparently, no older larval stages than those here described were found in the jars.

Metanauplius Stage (figs. 1–3).—This is the earliest stage known to the author, and that, it would seem, immediately succeeding the true Nauplius stage. It was represented by a solitary specimen, which measured only $\frac{1}{2}$ mm. in length.

The body is oval in form and does not exhibit the slightest trace of segmentation, nor any distinct limitation of the two principal divisions, so well defined in the adult animal.

The carapace is, however, distinctly indicated even at this early stage, forming, as it

were, an evenly arched clypeiform shield, that covers about the whole of the body, except a small obtusely conical part jutting out behind, and representing the rudimentary tail. It constitutes in the greater part of its extent the immediate wall of the body, being free only in its marginal zone, where it forms merely a slight fold, covering at the sides the bases of the budding limbs back to the oral opening.

Of the compound eyes, no trace whatever can be detected. Only a small spot of black pigment is observed anteriorly on the median line, and somewhat ventrally, representing the simple larval eye, or ocellus, which, as stated above, also occurs in the adult animal between the insertion of the compound eyes.

Posterior to the ocellus, and between the points of insertion of the antennæ, may be seen inferiorly a rather large carneous prominence, continuous anteriorly with the front part of the body, whereas, posteriorly, it ends as a free, arcuate edge. This prominence represents the anterior lip, arching partly over the oral aperture.

The posterior lip, on the other hand, is in this stage quite rudimentary, forming simply two slight transverse prominences (see fig. 3), which do not as yet mark off the oral aperture posteriorly, but lie at a considerable distance behind it, between the budding maxillæ.

Of limbs, only two pairs occur fully developed, representing the antennulæ and antennæ, both of which, but especially the latter, serve as natatory organs.

The antennulæ spring from the ventral face of the body at a short distance from its anterior extremity, and point, as a rule, straight forward. They consist of a slender non-articulate stem, about half the length of the body, curving slightly outward at the extremity, which tapers to an obtuse point and bears a few slender setæ, one of which is rather elongate.

The antennæ, originating at a short distance posterior to the antennulæ, are exceedingly mobile, and constitute the chief locomotive organs, by the powerful strokes of which the little animal is rapidly propelled through the water. They are of nearly the same length as the antennulæ, but rather dissimilar in structure, consisting of an indistinctly biarticulate and somewhat curved basal part, or stem, from the end of which spring two narrow cylindrical branches of equal size, provided at the tip with several slender and delicately ciliated setæ.

In addition to the parts described above, occur, along the ventral face of the body, four pairs of rounded transverse prominences, arranged symmetrically on either side, and separated in the middle by a narrow interstice. These prominences, very soft in consistence, and densely cellular in structure, represent the first traces of as many limbs, viz., the mandibles, the two pairs of maxillæ, and the maxillipeds. None of them, however, exhibit as yet the slightest trace of segmentation, or any armature of spines or bristles, forming merely simple buds of the body-wall.

The anterior pair of these buds, the mandibles, lie immediately behind the points of

insertion of the antennæ, on either side of the free edge of the anterior lip, separated as yet in the middle by a rather broad interstice. They are comparatively small, elliptical in form, and, on the outer side, drawn out to a conical point, the rudiment of the powerful biramous mandibular legs occurring in the Nauplius stage.

The three succeeding pairs lie in close contact with each other, forming rather broad transverse intumescences, which, at the inner corner, jut forth as rounded, somewhat posteriorly pointing lobes, double on the last pair (the maxillipeds).

The part of the body posterior to the above described parts, constituting the rudiment of the tail, is quite smooth, and somewhat flattened at the extremity, which is broadly truncate, with a very faint emargination in the middle. On either side of the emargination three very short spines are seen to arise from the edge.

First Calyptopis Stage (figs. 4–19).—The body has in this stage a length of about 1 mm., and exhibits (see figs. 4, 5) a more distinct limit between an anterior and a posterior division, the latter being, however, as yet much shorter than the former.

The carapace is now more fully developed, with the free portion broader, mantling over, as it were, the bases of the limbs, and forming anteriorly a hood-like expansion, that covers from above the anterior extremity of the body. The free edges are quite smooth and evenly curved, without teeth or projections, forming, however, a slight incurvation at the sides of the buccal area.

The posterior division of the body lacks as yet every trace of segmentation, constituting merely a simple, cylindrical projection, generally bent at a more or less distinct angle. It is, however, rather mobile, and admits, by the aid of a well-defined assemblage of muscles adjoining it on the upper face, of being stretched in nearly the same axis as the anterior division. At the extremity it is somewhat flattened and abruptly truncate, and has the terminal edge (see fig. 19) armed with a row of twelve strong ciliated spines, the six median about equal, the outer three on either side rapidly increasing in length to the innermost, which is very large and projected far beyond the rest. Besides the above-mentioned terminal spines a pair are seen arising from the ventral face at some distance from the extremity, each of the spines originating a little within the lateral edge.

Immediately in front of the posterior division of the body may be observed a faint and close wrinkling of the integument as a first indication of the segmentation of the trunk (see fig. 6).

The ocellus is distinctly perceptible, placed in the middle line at some distance from the anterior margin of the carapace (see fig. 6). When highly magnified (fig. 7) it is found to contain two small refracting bodies protruding from the pigment anteriorly.

On either side of the ocellus, and somewhat dorsally, occur beneath the hood-like expansion of the carapace (see figs. 4, 5) two large cellular bodies, of a somewhat compressed, semicircular shape, but as yet, however, comparatively indistinctly defined.

These bodies represent the first indication of the compound eyes; but neither pigment nor any trace of visual elements have appeared. All that can now be seen within these corpuscles consists of a bunch of densely crowded, glistening posteriorly diverging fibres, easily recognised as representing the peculiar luminous organ that occurs in the pedicles of the eyes of the adult animal.

The antennulæ (fig. 8) still constitute simple, somewhat curved stems, tapering toward the apex, but differ from those in the preceding stage in the apical part being marked off from the remainder as a distinct terminal joint, representing the outer flagellum. This joint juts out interiorly as a small denticle, bearing, moreover, at the tip, three slender bristles, and two translucent sensory appendages of unequal length. Of the inner flagellum, no trace has yet appeared, its place being occupied merely by two bristles springing from the end of the basal section or peduncle.

The antennæ (fig. 9) have the two segments of the basal part more distinctly defined, the distal segment being somewhat shorter than the proximal, and slightly dilated toward the end. The terminal branches, too, appear more fully developed and nearly as long as the basal part. The inner branch is simple cylindrical and non-articulate, bearing at the end four very long ciliated setæ and at the inner edge two smaller ones, the proximal setæ, very short and spiniform. The outer branch, on the other hand, has the apical part rapidly tapering, and divided into several (about five) very short articulations, provided at the inner edge with slender natatory setæ, successively diminishing in length toward the apex.

The anterior lip (see figs. 6 and 10) has become more distinctly marked off from the body-wall, forming a rather large oboval prominence, the posterior edge of which covers over the inner part of the mandibles.

The posterior lip (fig. 11) exhibits quite a normal aspect, its lobes being irregularly rounded and delicately ciliate along the inner edge.

All the three ventral limbs—in the preceding stage but faintly indicated—have now become active organs for conveying food to the mouth; hence they are mobile and armed with bristles and spines (see fig. 6).

The mandibles (see figs. 10, 12) have the inner (masticatory) part expanded in the usual manner, and exhibit, moreover, anteriorly an acute projection arising, it would seem, from the point where, in the Nauplius stage, the mandibular leg originates. Of a palp, on the other hand, no trace whatever can be found. The armature of the cutting edges (see figs. 13, 14) is well developed, though somewhat dissimilar to that in the adult animal, resembling rather the armature found in some Mysidæ. As occurs in the latter, the anterior part is divided into several strong and very closely arranged teeth, forming together two partly superposed portions, which in the two mandibles exhibit a somewhat different shape. Between this dentate part and the molar protuberance occurs a short dentiform projection, and at the base of the latter is affixed on both mandibles a very

peculiar narrow plate, somewhat expanded at the extremity, and having the apical edge finely denticulate. This plate (fig. 15), wanting entirely in the adult animal, would appear to be movably connected with the mandible, since it is very easily disengaged.

The first pair of maxillæ (fig. 16) exhibit all the parts observed in the adult animal, though they are of a somewhat dissimilar form and armature. Of the two masticatory lobes, the inner lobe is linguiform, and furnished with eight strong ciliate bristles, whereas the outer is truncate at the extremity, and armed with only two thick, digitiform spines ciliate at the tip, exclusive of a simple bristle originating between the spines. The terminal joint or palp is oval, not constricted at the base, and provided with six bristles, three of which spring from the tip, and three from the inner edge. The exognath is very small, forming only a minute knob-like projection furnished with four strong ciliate setæ, one very long and reflexed, whereas the three others are directed anteriorly.

The second pair of maxillæ (fig. 17) present a more deviating appearance, being rather narrow, with the inner edge divided into five small rounded lobes, provided with long ciliate setæ. The terminal joint is lamellar, and oblong in form, and bears at the rounded tip four curved setæ. Of a distinct exognath no trace can be found, the outer edge of the basal part being not in the least expanded, and furnished only at the distal part with a single ciliate bristle.

The maxillipeds (fig. 18) are in appearance totally different from those in the adult animal, having more properly the character of maxillæ than of legs. They consist of a rather broad and flattened basal part, divided into two distinct segments, and of two short terminal branches, the inner representing the endopodite, the outer the exopodite. The two segments of the basal part (the coxal and basal joints) have their inner edges somewhat expanded and setiferous, four slender ciliate setæ springing from the proximal segment, and four shorter ones from the distal. Moreover, a minute spine occurs between the two outermost setæ of the distal segment. The endopodite scarcely exceeds half the length of the basal part, and consists of two well-defined joints; the proximal is broader than long, and bears at the inner edge a short spine and a ciliate bristle, whereas the distal joint is ovate, and provided at the tip with four slender curving setæ. The exopodite is about the same size as the endopodite, but consists of only a single oblong joint, bearing four slender apical setæ. Of an epipodite, no trace whatever can be detected.

No other limbs are as yet developed, and, with the exception of the antennulæ and antennæ, they all serve, as true oral organs, for conveying food to the mouth.

Second Calyptopis Stage (figs. 20–22).—In this stage the larva has a length of 1½ mm., and is chiefly distinguished (see fig. 20) by a more perfect development of the tail, which has now fully attained the length of the carapace, and is also divided into seven distinct segments. The last of these, representing the telson (fig. 22), is somewhat spathulate at the end, and exhibits along the edge an armature similar to that in the preceding stage, except only that an additional spine has appeared in the middle of the apical edge, and

somewhat shorter than the rest. Beneath the outer integument can be faintly traced at the base of the telson two oval plates, the budding uropoda.

The cellular masses, representing the compound eyes, are somewhat more distinctly defined, and exhibit the fascicle of luminous fibres unaltered, whereas in the anterior part a small pigmentary spot has appeared, the first trace of the ocular pigment.

The antennulæ (fig. 21) have now become divided into a cylindrical, triarticulate peduncle, and two rudimentary flagella, the outer of which represents the terminal joint of the antennulæ in the preceding stage, whereas the much smaller inner flagellum has appeared in the present stage.

In the structure of the other limbs no difference can be observed from that in the preceding stage.

Third Calyptopis Stage (figs. 23–26).—This stage corresponds very nearly with the earliest stage of *Euphausia*, as figured by Professor Claus. The animal measures 2·20 mm. in length, and has (see fig. 23) the tail still more developed, appreciably exceeding the carapace in length.

The eyes, still completely covered over by the hood-like anterior expansion of the carapace, are almost globular, and exhibit, besides a somewhat more extensive accumulation of pigment, also the first faint trace of visual elements.

The antennulæ (fig. 24) are more powerfully developed, and from the outer corner of the basal joint juts forth a strong, anteriorly pointing spine, denticulate along the inner edge.

The other limbs belonging to the anterior division have remained nearly unaltered, with this exception, that the outer masticatory lobe of the first pair of maxillæ (fig. 25) has a greater number of spines, viz., five.

At the base of the telson (see fig. 26) the uropoda have developed, but are still very small and without any marginal setæ, exhibiting, however, their two terminal plates though not yet defined from the basal part. Of these, the outer is much the larger, and juts out at the end exteriorly as a strong spine, whereas the inner plate is very small and merely papillar in form.

No trace whatever either of legs or pleopoda can as yet be detected.

Of the inner organs in this and the preceding stages but little can of course be observed in the spirit-specimens. Having, however, thoroughly examined in this respect corresponding stages of the northern species, *Nyctiphanes norvegica* (M. Sars), in a living state, I am enabled to confirm the correctness of the statements respecting the inner organisation of the larvæ given by Professor Claus in his above quoted treatise.

Development of Euphausia pellucida, Dana (Pls. XXIX., XXX.).

Of this form, the most frequent of all the Challenger Euphausiidæ, numerous larvæ in different stages of development were found in the surface-gatherings sent me for

examination, and thus I have been enabled to trace the development of this species through all its numerous successive stages comprised between the second Calyptopis stage and the adult form. Of still earlier stages, on the other hand, no examples were found in the collection, and hence I have deemed it advisable to treat of the development of the present form next after *Nyctiphanes australis*, of which the earliest larval stages found have been described above.

With a view to show the progressive development of the several limbs, I have carefully dissected specimens of all the stages here described; and in Pl. XXX. series of figures of the same limbs, in different stages of development, have been given. I first propose to describe in general the more marked stages, and then shall pass on to a detailed investigation of the chief modifications the limbs undergo during development.

A. *General Description of the successive Larval Stages* (Pl. XXIX.).

Second Calyptopis Stage (figs. 1, 2).—From the corresponding stage of *Nyctiphanes australis*, this is easily recognised by the spine-like projection formed by the carapace posteriorly, as also by the anterior margin of the hood-like frontal part being finely denticulate. Moreover, the terminal segment of the tail (telson) would appear to be somewhat more produced and slightly deviating in its armature. In all other respects the larva closely resembles the corresponding stage of *Nyctiphanes*. Length of body $1\frac{1}{2}$ mm.

Last Calyptopis Stage (fig. 3).—This is precisely the same stage figured by Professor Claus in his treatise referred to above. It corresponds to the last described larval stage of *Nyctiphanes*, from which, however, it differs, in addition to the characters distinguishing the former stage, by the presence, on either side, of a well-marked lateral denticle projecting from the lower margin of the carapace posterior to the middle. Length of body 2·20 mm.

First Furcilia Stage (figs. 4, 5).—The most prominent feature distinguishing this stage from the two preceding ones, is the pronounced development of the compound eyes, which have now become mobile and freely projecting beyond the edges of the carapace, instead of, as in the Calyptopis stages, being immobile and hidden beneath the hood-like frontal part of the carapace. In accordance therewith, the anterior part of the carapace is somewhat altered, a distinct emargination having appeared on either side, limited beneath by an acute angle (the antero-lateral corners), and marking off in the middle a broad frontal plate arching over the basal part of the eye-pedicles and the antennular peduncles (see fig. 5). This plate has a somewhat cordiform shape, being slightly produced in the middle, and having the lateral edges evenly curved and finely denticulate.

As regards the limbs, the antennulæ, the antennæ, the mandibles, the two pairs of maxillæ, and the maxillipeds are nearly of the same appearance as in the preceding stage. Now, however, the first trace of two additional pairs of limbs have made their appearance, the one occurring immediately behind the maxillipeds and representing the first pair of legs, the other placed on the first caudal segment and representing the first pair of pleopoda. Meanwhile, both have still the character of simple, non-articulate, conical processes, without exhibiting the slightest trace of bristles or any other form of armature. Moreover, the uropoda have increased somewhat in size, and the terminal plates have become distinctly defined from the basal part, and furnished at the tip with a few slender setæ. The length of the larva in this stage is 2·65 mm.

Intermediate Furcilia Stage (fig. 6).—In this stage the carapace has lost its posterior spiniform projection, and the frontal plate has become narrower and more pointed. The two additional limbs mentioned above, and forming, in the preceding stage, merely simple non-articulate processes, have become more fully developed, being distinctly articulate and provided with a few setæ, and the first pair of pleopoda are even, in living specimens, found to act as swimming organs. In addition, several other budding limbs may be observed, viz., immediately posterior to the newly formed first pair of legs, the first trace of the following (second) pair of legs, and on each of the four medial caudal segments a pair of small conical processes, representing the corresponding pleopoda. Moreover, three of the luminous globules have made their appearance, viz., the foremost pair on the trunk, lying within the coxal joints of the first pair of legs, and the most anterior of the odd globules belonging to the tail. The telson and uropoda, finally, have slightly altered in form, the former being now somewhat narrower, and the latter a trifle more produced. Length of the larva 3·20 mm.

Last Furcilia Stage (fig. 7).—In this stage all the pleopoda have become developed, and act in the living animal as true swimming organs. On the trunk the second pair of legs have become articulated, though they are still much smaller than the first, and behind it a few minute bud-like projections may be seen, apparently representing two additional pairs of legs, besides the first trace of the gills. The antennæ until now have retained their original form and function unaltered, acting as powerful natatory organs, but in some specimens belonging to this stage the long plumose setæ are found to be partly obliterated, thus proving their original function as swimming organs to be nearly finished. The frontal plate of the carapace has lost its marginal dentition, and is very narrow, assuming accordingly a form more in relation with that of the adult animal. Length of the body 3·60 mm.

First Cyrtopia Stage (fig. 8).—The character distinguishing most prominently this stage from those preceding it, is the total change in structure and function of the antennæ. These limbs now cease entirely to act as swimming organs, and hence have lost their great mobility, being now invariably extended forwards, and not, as in the

preceding stages, sideways. Of the two branches, the one has assumed the character of the scale, the other of the flagellum. Both flagella of the antennulæ have become considerably elongated and divided into distinct articulations. The two anterior pairs of legs are more fully developed and nearly equal in size, both having acquired the geniculate bend characteristic of the adult animal. Posterior to these, another pair of legs have developed, and the gills are distinctly visible, though still exhibiting a very simple structure. The hindmost pair of luminous globules on the trunk have just appeared, and on the tail all the globules are quite distinct. Length of body 3·80 mm.

Last Cyrtopia Stage (fig. 9).—In this stage the flagellum of the antennæ has increased considerably in length, and its basal part is clearly defined from the terminal part. On the trunk occur three pairs of distinctly developed, geniculate legs, and behind them another much smaller pair have made their appearance. The endopodite of the maxillipeds is somewhat prolonged, and has a more pronounced pediform appearance. Finally, the gills are somewhat more complex in structure than in the preceding stages. Length 4·15 mm.

First Post-Larval Stage (fig. 10).—The full number of legs is now developed, and the animal, on the whole, exhibits all the characters distinguishing the adult form, except that the flagella of the antennulæ and antennæ have not yet attained their full length, that the gills are still comparatively simple in structure, and, finally, that the anterior pair of the lateral denticles of the carapace are not yet developed. Length of the animal in this stage about 5 mm.

B. *Development of the several Appendages of the Body* (Pl. XXX.).

The Compound Eyes (fig. 9).—In the Nauplius and Metanauplius stages these organs are entirely wanting, as shown to be the case in the last of these stages in *Nyctiphanes*. In the Calyptopis stages they are still very imperfectly developed, forming immobile rounded masses, wholly covered by the carapace and devoid of any distinctly developed visual elements. In the last only of these stages a faint trace of the ocular pigment and a few radiating stripes may be seen in the anterior part of the eyes. Not till the Furcilia stages do the organs (fig. 9) become mobile and pedunculate, as also freely projecting towards either side. The cornea has become formed, but its areolation is still imperfect, and the visual elements, radiating from the ocular pigment, are unequally developed, those in the middle being still quite rudimentary. The luminous ascicle, distinct in the earliest stages, has now a narrow ring of red pigment coating on the base. The following development of the eyes proceeds quite gradually, and as early as the Cyrtopia stages, they exhibit much the same appearance as in the adult animal, though comparatively smaller and less expanded at the tip.

The Antennulæ (figs. 1–5).—These limbs, constituting in the Nauplius and Metanauplius stages simple, non-articulate stems, exhibit each of them (fig. 1) in the earliest Calyptopis stage described above, and apparently corresponding to the second Calyptopis stage of *Nyctiphanes*, a slender non-articulate peduncle, bearing at the apex two very small, uniarticulate flagella, the outer a little longer than the inner, and provided with a pair of slender bristles and two sensory appendages.

In the following (last) Calyptopis stage, these limbs (fig. 2) are much more fully developed, the peduncle being rather strong, and divided into three distinctly defined joints, of which the basal is by far the largest, and projects at the end exteriorly as a strong spine, denticulate at the inner edge, and reaching almost to the end of the peduncle. The second joint is quite short, and bears at the inner edge two strong ciliate setæ. The last joint is almost twice as long, and has a single bristle internally. The flagella do not exhibit any essential difference from those in the preceding stage.

In the Furcilia stages the number of bristles along the inner edge of the peduncle has become somewhat augmented, and the two flagella have slightly increased in length, though still uniarticulate. In the last of these stages (see fig. 3) the long apical bristles of the flagella are lost, and the two sensory appendages of the flagellum, arising originally from the tip, are now affixed to a ledge-like projection of the inner edge, near the base.

In the Cyrtopia stages the peduncle (fig. 4) has a somewhat greater similarity to that of the adult animal, the spine springing from the basal joint being somewhat reduced in size, and both the flagella considerably elongated and divided into a number of distinctly defined articulations.

But not till the last stage described above—the first post-larval stage—do the antennulæ (fig. 5) assume their definitive form, differing only from those of the adult animal in the dorsal leaflet of the basal joint being still but slightly indicated, and in the flagella having not yet attained their full length.

The Antennæ (figs. 6–8).—The structure of these limbs is much the same throughout all the Calyptopis and Furcilia stages. They differ widely from those in the adult animal both in form and function, constituting, as they do, very mobile, biramous natatory organs of much the same appearance as that described above in the larvæ of *Nyctiphanes*, and strongly reminding one of the second pair of antennæ in the Calanoid Copepoda.

In the last Furcilia stage some of the natatory setæ are sometimes, however, found to be obliterated (see fig. 6), though in other respects no difference in the structure of the organs has yet arisen.

But in the next, or first Cyrtopia stage, these organs (fig. 7) are seen to have suddenly undergone a total alteration alike in structure and function, having lost their great mobility, and assumed a form more in accordance with that of the adult animal. The basal part is shortened and has lost its segmentation, whereas a slender spine has sprung from the end externally, representing the basal spine of the adult animal. Of

the two branches, originally nearly similar in structure, the outer has assumed the character of an oval scale, fringed along its inner edge and apex with a regular series of slender bristles, whereas the inner branch has retained its cylindrical form, though somewhat produced and divided into a biarticulate peduncle, and a non-articulate, naked, and digitiform, terminal part, forming together the flagellum.

In the next Cyrtopia stage the flagellum becomes still more produced. But not till the first post-larval stage does it assume (fig. 8) its definitive structure, the peduncle being then triarticulate, and the terminal part subdivided into a number of distinctly defined short articulations, furnished with minute bristles.

The Mandibles (figs. 10–12).—Also these organs exhibit no change whatever through most of the larval stages, retaining (fig. 10) the peculiar armature of their cutting edges, as described above in the larvæ of *Nyctiphanes*, and also the spiniform projection occurring at the base of the masticatory part anteriorly. Of a palp no trace whatever can be detected previous to the Cyrtopia stages, when a very small and soft knob-like projection first appears on the outer face of the mandibles, at the base of the masticatory part. This process becomes, in the second Cyrtopia stage, somewhat more elongate (see fig. 11), but is still non-articulate and naked. Finally, in the first post-larval stage, the palp (see fig. 12) has become considerably produced, and divided into three distinct articulations, the two outer of which bear each a single bristle. In this and the two preceding stages, moreover, the peculiar supplementary plate of the cutting edge, described above in the larvæ of *Nyctiphanes*, and also occurring in the larvæ of *Euphausia*, would appear to be entirely lost.

The First Pair of Maxillæ (figs. 13–15).—The appearance of these maxillæ in the larvæ previous to the Cyrtopia stages (fig. 13) is much the same as that described above in the larvæ of *Nyctiphanes*, with this exception, however, that the palp is distinctly biarticulate. In the Cyrtopia stages, however, the palp becomes uniarticulate, its two original joints being fused together (see fig. 14), and at the same time it assumes a somewhat oval form, still more pronounced in the following stage—the first post-larval (see fig. 15). In the latter stage, too, the true exognath makes its appearance, originating, apart from the larval exognath, in the form of a thin elliptical lamella bearing only a single bristle at the tip. The larval exognath, with its four strong setæ, is still found in this stage beneath the newly formed lamellar exognath, but in the following entirely disappears.

The Second Pair of Maxillæ (figs. 16–18).—Also these maxillæ exhibit scarcely any change throughout the true larval stages, their structure (fig. 16) being very similar to that described above in the larvæ of *Nyctiphanes*. The first perceptible alteration is observed in the last Cyrtopia stage, when a new setæ has developed behind that affixed to the end of the basal part exteriorly (see fig. 17). In the succeeding stage (first post-larval) three more setæ are added (see fig. 18), constituting, along with the two

others, a regular series along the outer edge of the basal part, which appears here a little expanded, thus representing the first rudiment of the lamellar exognath. The terminal joint, or palp, in this stage is now considerably expanded, and assumes a form more in accordance with that of the adult animal, though still provided with only three setæ. In the following stages, however, the number of setæ gradually increases, and the short spiniform bristles, characteristic of the present species, make their appearance, only a single one being at first developed.

The Maxillipeds (figs. 19–22).—In the Calyptopis and Furcilia stages these limbs retain their original structure (see fig. 19) almost unchanged, agreeing precisely with that of the larvæ of *Nyctiphanes*, as described above. In the last Furcilia stage, however, a very slight elongation of the endopodite can be traced, and in the first Cyrtopia stage this part (see fig. 20) has become triarticulate, the middle joint being rather elongate and exhibiting a slight trace of a median constriction, whereas the apical joint is very small. In the last Cyrtopia stage the endopodite (see fig. 21) is still more produced and distinctly four-jointed, and, finally, in the first post-larval stage this part (see fig. 22) has become quite pediform and composed of five distinctly defined joints. The exopodite in the same stage shows an incipient division into two principal parts, viz., the basal and terminal, the division, however, being not yet fully complete.

The Legs (figs. 23–27).—The first trace of these limbs is found in the first Furcilia stage, a pair of small simple processes (fig. 23) then appearing just behind the maxillipeds. These processes, representing the first pair of legs, rapidly increase and give origin, at their outer side, to a small lateral knob, the first appearance of the exopod (see fig. 24). In the intermediate Furcilia stage, represented in Pl. XXIX. fig. 6, the endopod (fig. 25) has already become distinctly articulated and provided with a few small bristles. Moreover, in this stage the luminous globule, imbedded in the coxal joint, is faintly seen, as also the first trace of the corresponding gill. In the last Furcilia stage these legs (fig. 26) are quite pediform, the endopod being rather produced and five-jointed, and in the Cyrtopia stages (fig. 27) they assume more and more the structure characteristic of the adult animal, until, in the first post-larval stage, they merely differ by reason of the somewhat smaller number of marginal bristles.

The second pair of legs are found in the intermediate Furcilia stage, budding forth behind the first in precisely the same manner as that pair; and the following pairs make their appearance successively in the next stages, until, in the first post-larval stage, all the five pairs present in the adult animal are fully developed, the last, however, being still very small.

The Gills (figs. 28–32).—As previously stated, the first trace of these organs occurs as early as the intermediate Furcilia stage described above, but merely as inconspicuous simple knob-like projections at the bases of the budding legs (see fig. 25). In the last

Furcilia stage (fig. 28) four pairs of gills have made their appearance, of which the anterior three are now bifurcate (see also fig. 26), the last pair simple. In the following stage (first Cyrtopia stage) six pairs may be seen (fig. 29), the three anterior being still bifurcate, whereas the next pair are very small and knob-like; and of the two last pairs, the anterior are bifurcate, the posterior simple. At the base of the former occurs a rounded expansion, within which a luminous globule has appeared, and hence these two pairs are found in reality to represent the two last pairs in the adult animal. The antepenultimate pair are of course not yet developed, nor is any trace of the corresponding legs as yet perceptible. In the last Cyrtopia stage (fig. 31), however, all the gills have developed, the four anterior pairs being bifurcate, the fifth simple, the penultimate quadripartite, and the last tripartite. Finally, in the first post-larval stage (fig. 32) the third and fourth pairs have become tripartite, the fifth bifurcate, and the two last pairs respectively quinque- and sex-partite. During the progressive growth of the animal the gills gradually acquire a more complex structure, the two last pairs in particular becoming rapidly larger and more distinctly arborescent.

The Pleopoda (figs. 33–35).—The development of these limbs does not commence till the Furcilia stage, and proceeds successively from before backwards. In the first of these stages a pair of small bud-like processes are seen springing from the ventral face of the first caudal segment. When isolated and strongly magnified, these processes (fig. 33) exhibit a somewhat lanceolate form, and have on the inner side a very small projection—the first trace of the inner plate. In the stage occurring between the two first Furcilia stages described above, similar bud-like processes successively appear on the following three caudal segments. In the intermediate Furcilia stage, figured in Pl. XXIX. fig. 6, the penultimate segment has also acquired a similar pair of buds, and those belonging to the first caudal segment have now attained a more complete development (fig. 34), being composed of a distinctly defined basal part and two terminal plates, the outer of which is much the larger, and furnished with six natatory setæ, whereas the inner is very small, conical in form, and bears a single apical seta only. The other pleopoda now successively acquire a similar structure, while the anterior pair develop further (fig. 35), their inner plate becoming more complete, acquiring at first an additional seta springing from the outer edge, as also a small projection at the inner edge, representing the secondary lobe occurring in the adult animal. The following development proceeds successively from before backwards, till finally all the pleopoda have acquired their definite form.

The Telson (figs. 36–42).—This part undergoes a constant change during the several stages of development, being at first very broad and spathulate in form, and becoming successively narrow until at last it assumes the slender spine-like form characteristic of the adult animal. This change is also, as will appear in the sequel, accompanied by a

remarkable alteration in the armature, most of the spines observed in the larval telson at length wholly disappearing, and a few only being left to acquire the peculiar form characteristic of those in the adult animal.

In the earliest Calyptopis stage described above, the telson (fig. 36) is not yet defined from the last caudal segment. It constitutes a broad spathulate plate, constricted a little posteriorly to the middle, and armed on either side with a strong lateral spine. The end is somewhat expanded and broadly truncate, and its terminal edge fringed with a row of thirteen strong ciliated spines. Of these, the median is very small, the three succeeding ones on either side being somewhat larger and uniform in size. The three outermost spines on either side, occupying the rounded lateral corners, are much stronger than the rest, and the middle one by far the largest, projecting considerably beyond the others.

In the last Calyptopis stage the telson (fig. 37) is distinctly defined from the last caudal segment by a well-marked suture, and at its base the uropoda have developed. The form and armature of the telson do not, however, differ materially from those in the preceding stage.

In the first Furcilia stage the telson (fig. 38) has become somewhat narrower in proportion to its length, and the median of the terminal spines has attained the size of those succeeding it on either side, all forming together an uninterrupted row of seven uniform and comparatively short spines occupying the median part of the terminal edge.

In the intermediate Furcilia stage the telson (fig. 39) is considerably narrower than in the preceding stages, though still somewhat expanded towards the end, which has assumed a broadly rounded form, the middle part, bearing the seven small spines, being somewhat protruded. Of the three outer spines, the innermost has become remarkably strong, though still shorter than the middle one, and the cilia at its inner edge are coarser and more dentiform.

In the last Furcilia stage the telson (fig. 40) is almost linear, being scarcely at all expanded at the end. The middle part of the extremity protrudes considerably, being, however, still truncate at the tip, and bearing the original number of spines (seven), which are very small and densely crowded together. Of the outer spines, the innermost has still more increased in size, being almost as long as the middle one and much thicker, whereas the outermost spine has diminished in size.

In the first Cyrtopia stage the telson (fig. 41) is very narrow, linear, and the middle part of the extremity juts forth as a conical process, bearing at its narrow truncate tip only three spines, four of the original ones having disappeared. The innermost of the outer spines, on either side, is now very large and sharpened at the inner, strongly denticulate edge, as also distinctly projecting beyond the others.

In the last Cyrtopia stage the telson (fig. 42) has nearly assumed its definitive form, being somewhat inerassate at the base and slightly tapering towards the apex,

which juts out as a lanceolate pointed projection, all the original spines affixed to this part in the earlier stages having disappeared. The three outer spines on either side of this projection are still present in this stage, and the innermost of these spines is very large and has already assumed the form characteristic of the subapical spines in the adult animal, whereas the outermost is exceedingly small and easily recognised as representing the posterior pair of dorsal spines in the adult animal.

In the first post-larval stage, finally, the telson has assumed the precise appearance characteristic of the adult animal, the middle of the exterior spines having been wholly lost.

Thus, of the spines occurring on the telson in the larva, three pairs only are retained in the adult animal, viz., the lateral spines, which represent the anterior pair of dorsal denticles, the outermost, on either side, of the terminal spines, constituting the posterior pair of dorsal denticles, and the third spine on either side, counted from the outer corner, which are modified to form the peculiar subapical spines of the adult animal. All the other spines wholly disappear in the course of the larval development.

The Uropoda (figs. 37–42).—As stated above, these limbs are entirely wanting in the earliest larval stages (see fig. 36), not appearing till the last Calyptopis stage, when they are (fig. 37) very small and have only an indistinct mark between the basal part and the terminal plates, the latter being furnished with but very few bristles proceeding from their apex; of the plates, the exterior one is the longer, and has the outer corner drawn out to a strong spine. In the following stages (figs. 38–40) the uropoda develop by degrees more fully, the terminal plates increasing in length and becoming furnished with a greater number of bristles, continued along their inner edge, till in the first post-larval stage (fig. 42) they have almost attained the aspect characterising those of the adult animal, though still somewhat shorter in relation to the telson.

The Luminous Apparatus (figs. 9, 25–32).—Of the numerous organs constituting this peculiar apparatus, those occurring in the eye-pedicles of the adult animal are first developed. According to the statements of Metschnikoff, even in the Nauplius stage the peculiar fascicle of glistening fibres, constituting the essential part of these organs, is distinctly seen on either side of the larval eye, or ocellus, no trace of the compound eyes being as yet observed. In all the succeeding stages these organs are readily discerned, imbedded in the base of the developing eyes. The other organs, the true luminous globules, make their appearance at a much later period, and are not all developed at the same time, but appear successively. In the intermediate Furcilia stage (Pl. XXIX. fig. 6) only three such globules are developed, viz., the anterior of the two pairs belonging to the trunk, and the foremost of the odd caudal globules. In the last Furcilia stage the posterior pair belonging to the trunk have likewise appeared, though being still but very faintly defined (see fig. 29), as also another of the caudal globules. The remaining two caudal globules successively appear in the following

Cyrtopia stages, and in the first post-larval stage all of the globules have been fully developed.

The Internal Organs (Pl. XXIX.).—As regards the development of the internal organs, the following observation may be here added:—

The ganglia of the nervous cord are at first imperfectly defined from one another, forming merely a continuous ganglionic mass, exhibiting but slight intumescences at regular intervals. Not till the tail has been fully segmented are the commissures connecting the caudal ganglia distinctly seen, though at first very short.

The digestive system would not seem to commence performing its functions till after the Metanauplius stage, or when the oral organs have become mobile and armed with bristles and spines, a considerable supply of food-yolk having been left within the body of the Nauplius to be at first absorbed. In the earliest Calyptopis stage, however, the intestinal tube is distinctly seen traversing the whole length of the body, and, in living specimens, exhibiting energetic peristaltic movements. Anteriorly, at the junction of the intestine with the stomach, a well-marked rounded cæcum, also present in the adult animal, is seen protruding above. The liver constitutes at first only two or three simple cæciform appendages on either side (see Pl. XXIX. fig. 1). These appendages become in the following stages subdivided into short lobes (see fig. 2), which increase gradually in number, forming at length the compound lobular masses constituting this organ in the adult animal (see following figures). The anal opening is found in the early Calyptopis stages at the base of the spathulate extremity of the tail (telson), in the form of a short longitudinal fissure, bounded by two thickened lips (Pl. XXX. fig. 36).

The heart, even in the earliest Calyptopis stages (and also in the Metanauplius stage), can be distinctly seen beneath the posterior part of the carapace, and resembles, at least as regards form, in every respect that of the adult animal. In living specimens it may at once be detected by reason of its quick and rhythmical pulsations. Furthermore, the chief arteries would seem to be developed even in these early stages, as shown by Professor Claus in his treatise referred to above (page 149).

Development of Thysanopoda tricuspidata, Milne-Edwards (Pl. XXXI. figs. 1–22).

The development of this form differs in certain points distinctly from that of *Nyctiphanes* and *Euphausia*, and the general appearance of the larvæ is so very unlike that of the adult animal, that I certainly should not have been able to refer them to the above named form, if there had not, fortunately, been in the Challenger collection a considerable number of specimens in different stages of development, thus connecting the larval forms with the adult form. The specimen described by Dana as *Cyrtopia rostrata* I regard as belonging to this species. In the following pages I purpose describing some of the most characteristic stages.

Calyptopis Stages (figs. 1, 2, 7, 13–17).—I have only had the opportunity of examining two not very well-preserved specimens in these early larval stages, and have figured both. They were found to represent two successive stages, apparently corresponding to the two last Calyptopis stages, as described above of *Nyctiphanes* and *Euphausia*. The length is respectively $2\frac{1}{2}$ and $3\frac{1}{2}$ mm.

The form of the body in both specimens (figs. 1, 2) is very slender, especially the tail. The carapace is rather large, with evenly arched edges, and forms in front a hood-like expansion, covering the eyes and basal parts of the antennulæ. The tail is distinctly segmented, but in the smaller specimen (fig. 1) the last segment has not yet been defined from the telson, whereas in the other (fig. 2) all the segments are distinct.

The eyes (fig. 7) exhibit a very peculiar form, being oblong-ovate, with the extremity tapering to an obtuse point, on which occur seven distinctly marked lenticular facets of the outer integument. Imbedded within each eye is a dense fascicle of delicate fibres extending well-nigh in the longitudinal axis, and apparently representing the luminous organ.

The antennulæ and antennæ exhibit much the same structure as in the corresponding stages of *Nyctiphanes*, the former organs consisting in both specimens of a triarticulate peduncle and two very small uniarticulate flagella; moreover, in the larger one, the strong spine arising from the basal joint exteriorly has been developed, whereas in the other it is still wanting.

The four pairs of ventral (oral) appendages (figs. 13–16) also present considerable resemblance to those in the Calyptopis stages of *Nyctiphanes* and *Euphausia*, though differing in the following particulars:—

The projection jutting out from the mandible (fig. 13) at the base of the masticatory part is remarkably large and spiniform, tapering to a very acute point. The palp, or terminal part, of the first pair of maxillæ (fig. 14) consists of a single joint bearing three bristles only. That of the second pair of maxillæ (fig. 15) is exceedingly small. On the other hand, the exopodite of the maxillipeds (fig. 16) is relatively larger than in the corresponding stages of *Nyctiphanes* and *Euphausia*, projecting considerably beyond the endopodite, and furnished with five strong ciliate setæ, exclusive of a much shorter seta affixed to its base.

The telson (fig. 17) exhibits the usual spathulate form, being conspicuously expanded towards the apex, which is slightly incurved in the middle, with the lateral corners evenly rounded off. It is armed with the same number of spines as in the larvæ of *Euphausia*, viz., two lateral and thirteen terminal, but the spines are slightly different as regards arrangement and relative size. Thus the lateral spines are affixed somewhat anteriorly to the middle, not posterior to it, as in the larvæ of *Euphausia*. Moreover, the terminal spines are rather unequal in size, the median,

arising from the bottom of the incurvation being very small, whereas the three following on either side increase in size successively. Of the three outer spines, occupying the lateral corners, the innermost is by far the largest, projecting considerably beyond the others.

The uropoda, wanting in the smaller specimen, were distinctly developed in the other (fig. 17), though still rather small.

Furcilia Stages (figs. 3–5, 18, 19).—There are several successive stages in the collection, of which I have figured two, having a length respectively of 4·20 mm. and 5·00 mm. They all are distinguished by an exceedingly slender form and a distinctly marked median bend of the tail.

The carapace has lost the hood-like expansion characteristic of the Calyptopis stages, the frontal margin being deeply emarginate on either side, so as to allow of the eyes projecting freely, and juts out in the middle as a narrow horizontal rostral projection, which in the earlier stage (figs. 3, 4) is truncate at the tip. The inferior margins of the carapace are, moreover, armed posteriorly to the middle with a strong denticle.

The eyes exhibit nearly the same appearance as in the Calyptopis stages, being, however, a trifle more tumid in the middle, and also distinctly pedunculated and mobile. In the latter of the two stages figured here a densely crowded fascicle of visual elements (crystalline cones), enveloped at the base by a dark pigment, has appeared within the extremity of the eye (fig. 8), corresponding, as to number, to the seven lenticular corpuscles mentioned above as occupying the tip of the eye. As will appear from the following development, this is quite a provisional visual apparatus, the true cornea not being developed till a much later period.

In the younger of the two specimens figured here (figs. 3, 4) no trace either of the legs or of the pleopods has yet appeared, the limbs being precisely the same as in the Calyptopis stages. On the other hand, in the somewhat older specimen represented (fig. 5), the budding anterior legs, as also the first trace of the gills, may be distinctly seen behind the maxillipeds. Moreover, on each of the three anterior caudal segments a pair of pleopoda have appeared, but very small, immobile, and without bristles.

The telson (figs. 18, 19) has become rather narrow, scarcely at all expanded at the extremity, which is at first rounded off (fig. 18), without any trace of the original median incurvation. The seven median spines form a continuous row occupying the most prominent part of the extremity, which becomes gradually more prominent (fig. 19), and at length juts forth as a median process on either side of which the large innermost one of the outer spines projects.

Cyrtopia Stage (figs. 6, 9, 20, 21).—In this stage the animal has a length of $6\frac{1}{2}$ to 7 mm., and already exhibits certain characters indicating its parentage. Thus, the carapace presents above, at some distance posterior to the rostral projection, a small knob-like prominence as a trace of the peculiar flattened spine characteristic of the adult animal.

Moreover, the posterior caudal segments are produced, as in the full-grown animal, at the middle of the posterior margin into distinct dorsal projections, of which that on the third segment is the largest. Finally, the first pair of caudal epimera begin to assume their characteristic form, jutting forth anteriorly as small dentiform projections.

The eyes (fig. 9) have acquired a considerable dilatation in the middle anteriorly, and within this dilatation the first faint trace of the true cornea, with its visual elements and ocular pigment, may be seen; the extremity of the eye being still produced into an obtuse point, containing the provisional visual apparatus described above.

The antennæ have lost their mobility, as in the corresponding stage of *Euphausia*, and are so modified as nearly to agree in their structure with those of the adult animal, the two original natatory branches having respectively been transformed into the scale and the flagellum.

Four pairs of legs have developed, and the gills may be distinctly seen along the sides of the trunk beneath the carapace, increasing in size posteriorly, the anterior pairs being still only bifurcate.

On the tail, all the pleopoda have been fully developed and adapted for swimming.

Also the luminous globules are now all well defined.

The telson has acquired its characteristic slender form, and the largest of the terminal spines (see fig. 20) are easily recognised as representing the subapical spines of the adult animal. The median part of the apex is considerably produced, and its tip is not, as in the former stages, truncate, but juts out as an acute angle. The two outermost spines on each side are still unchanged. In one of the following stages (fig. 21) one pair of the latter has withdrawn to the dorsal face of the telson, constituting the posterior pair of dorsal denticles of the adult animal.

Post-Larval Stages (figs. 10–12, 22).—In these stages the animal can easily be recognised as a young *Thysanopoda tricuspidata*, exhibiting, as it does, all the essential characteristics distinctive of that species. It still, however, retains a peculiar remnant of its larval existence. For when viewed from above (fig. 10) the eyes are found to exhibit a most remarkable form, unlike that of the adult animal, being drawn out at the exterior side of the cornea to a mamillar projection, at the tip of which the seven lenticular facets, mentioned above as occurring in the larvæ, form a perfectly circular area, one of the lenses occupying the centre and the other six being placed in a regular circle around it (see also figs. 11, 12). Within this projection the original fascicle of crystalline cones appears with great distinctness, as also the dark pigment deposited at their base. On the other hand, the true cornea, though considerably expanded, is still very imperfectly developed, its areolation being indistinctly marked, and the pigment having a rather diffuse character. In the following stages this part, however, becomes gradually more fully developed, while the mamillar projection is reduced in size and finally disappears altogether.

The telson assumes, even in the first of the post-larval stages, the form characteristic of the adult animal, the apex (fig. 22) being produced into an acuminate point, armed on either side with three small denticles—the original terminal spines. Moreover, the outer spine, occurring in the last Cyrtopia stage next to the subapical spines, has entirely disappeared.

Development of Nematoscelis rostrata, G. O. Sars (Pl. XXXI. figs. 23–29).

The earlier larval stages of this form would not seem to exhibit any marked peculiarities, and hence I shall only describe three of the later stages, in which the characters of the genus are first discerned. Two of these are Furcilia stages, the third a Cyrtopia stage.

Furcilia Stages (figs. 23, 24, 26–28).—The form of the body in these stages, which measure respectively $3\frac{1}{2}$ mm. and 4 mm. in length, is far from being so slender as in the corresponding stages of *Thysanopoda tricuspidata*, resembling in this respect more closely the Furcilia stages of *Euphausia*.

The carapace has on either side a very strong lateral denticle, projecting from the inferior margin posteriorly to the middle, and is also distinguished by a conspicuous rounded crest, rising from about the middle of the dorsal face. The rostral projection is very large, horizontal and sharply pointed, though broad and flattened at the base, more especially in the earlier stage.

Of legs, two pairs have made their appearance, being, however, in the earlier of the two stages (figs. 23, 26) still very imperfect as to structure, non-articulate, and without bristles. But even in this rudimentary state the peculiar modification of the first pair, so characteristic of the genus, is distinctly recalled, the corresponding buds (fig. 26) being remarkably massive, and exhibiting a most conspicuous S-shaped flexure. In the later stage (fig. 24) both of the two anterior pairs of legs have become articulated, and the first pair now very clearly present the peculiar structure characteristic of the genus *Nematoscelis*, though they are as yet far from having attained their full length. In this stage also some of the gills are seen budding forth behind these legs.

Of the pleopoda, four pairs only have been formed in the earlier of the two stages (fig. 23), and of these the first pair only are differentiated into a basal part and terminal plates, whereas the other three still represent merely simple bud-like processes. In the later stage (fig. 24), on the other hand, all the pleopoda have appeared, and only the last pair retain their original bud-like character, whereas the other pairs are fully developed and adapted for swimming.

The telson in the earlier stage (fig. 27) is still rather broad, and slightly expanded at the apex, with a pair of lateral spines about the middle of its length. The number of terminal spines is that usually met with, viz., thirteen, seven of which form a continuous

series along the abruptly truncate middle part, whereas the six others are arranged, three on either side, along the obliquely rounded lateral corners. Of the latter, the innermost is by far the largest. In the later stage, the telson has become considerably narrower, and the middle part of the apex (fig. 28) has begun to jut forth as a still rather broad projection, truncate at the tip.

Cyrtopia Stage (figs. 25, 29).—The transformation of the antennæ clearly distinguishes this stage from the two former as a true *Cyrtopia*. The animal has now attained a length of $4\frac{1}{2}$ mm., and may easily be recognised as a young *Nematoscelis rostrata*. The first pair of legs are considerably elongated and slender, having nearly attained the structure characteristic of the adult animal, and the gills are also more fully developed. All the pleopoda have assumed their definitive form, and the luminous apparatus would also seem to be distinctly developed. The telson closely resembles in form that of the adult animal, but still retains some of the larval spines. The middle projection of its extremity (fig. 29) is considerably produced, but narrowly truncate at the tip; and of the seven original spines, three only remain. Of the three outer spines, the innermost on either side is much larger than the others, and has assumed the character of the subapical spines. In a succeeding stage, the outermost on either side is withdrawn to the dorsal face of the telson, thus constituting the posterior pair of the dorsal denticles of the adult animal, whereas the intermediate spine has altogether disappeared.

Larval Stage of Euphausia sp. (?).

First Furcilia Stage (Pl. XXXI. figs. 30, 31).—I give a figure of this larva, not only because it exhibits an unusual size and a rather peculiar aspect, but also because another stage of precisely the same form has been described at a much earlier date, without, however, having been at that time recognised as a larva of *Euphausia*.

In the second part of his researches on the structure and development of the Arthropoda,[1] Professor Dohrn has given figures and descriptions of several very remarkable larval forms,[2] of which that figured in plate 30, fig. 54 undoubtedly represents a Calyptopis stage of precisely the same form as that treated of here. This larva was met with in the Indian Ocean, and regarded by Professor Dohrn—though with some reservation—as a Peneuszoëa. That this assumption is erroneous, and that the larva in question should be comprised under the Euphausiidæ, I feel no doubt whatever in asserting; and, moreover, I think there are reasons for assuming both these larvæ to belong to a large-sized species of the genus *Euphausia*, perhaps that briefly mentioned by the late Dr. v.

[1] *Zeitschr. f. wiss. Zool.*, Bd. xxi., p. 356, 1871.

[2] I take the present opportunity of stating my conviction that the forms described by the said author as *Cerataspis monstrosa*, Gray, and *Cerataspis longiremis*, n. sp., and considered as adult animals belonging to the Schizopod tribe, are both of them larvæ in the last stage (Mysis stage) of some large forms of Macrura of the Homaroid group.

Willemoes-Suhm under the name of *Euphausia simplex*, but unfortunately wanting in the collection.

What distinguishes these larvæ at the first glance is the very peculiar armature of the free edges of the carapace, which are coarsely and elegantly denticulate in a regular pectiniform manner, the denticulation being quite continuous all round in the Calyptopis stage described by Dohrn, whereas in the Furcilia stage represented here it is interrupted by the lateral emarginations of the frontal margin, from which the eyes project.

The solitary specimen in the collection (fig. 30) has a length of nearly 5 mm., and evidently corresponds, as regards the development of the limbs, to the first Furcilia stage of *Euphausia pellucida* (Pl. XXIX. figs. 4, 5), from which, however, it differs, not only in its much larger size and the above-mentioned peculiar armature of the carapace, but in some other points to be set forth in the sequel.

The carapace is comparatively very large and tumid, and has the inferior margins strongly arched in the posterior part and somewhat incurved anteriorly to the middle, as also terminating anteriorly in an acutely produced angle. Posteriorly, it juts forth in the middle as a rather strong, spine-like projection, and is, moreover, provided in the middle of the dorsal face with a distinctly marked rounded crest. The frontal plate is very large and broadly rounded at the extremity, and coarsely denticulate along the terminal edge, the denticles being somewhat larger than those occurring along the inferior margins of the carapace.

The tail is comparatively slender, and has the edges of the rounded epimera finely serrate. The third segment juts out posteriorly as a small but well-defined dorsal projection. The last segment is but little longer than the preceding, and quite smooth.

The eyes are rather large and projecting, of a slender clavate form, with the cornea comparatively small.

Of limbs, the antennulæ, antennæ, mandibles, two pairs of maxillæ, and the maxillipeds are distinctly developed, exhibiting, it would seem, a structure closely resembling that in the corresponding stage of *Euphausia pellucida*. In addition, as in that stage, the first trace of the anterior pair of legs and of the first pair of pleopoda has appeared, both having as yet merely the form of small bud-like processes.

The telson (fig. 31) is very large, almost equalling in length the three preceding segments taken together, and gradually expanding towards the apex, which is broadly truncate and slightly emarginate in the middle. The number of spines is as usual fifteen; meanwhile both the lateral and three outer on each side of the terminal ones are remarkably large and spinulose at the edges, whereas the seven median are very small, especially the middle one, which is, moreover, quite smooth. The lateral spines are placed at the last third of the length of the telson; and of the three outer spines of the terminal edge, the middle one is much the largest, projecting far beyond the rest.

The uropoda (fig. 31) are still rather small, but have their basal part and terminal plates well defined, the latter exhibiting a few slender marginal bristles. The outer plates are highly distinguished by the remarkable length of the spine jutting out from the outer corner; moreover, this spine is finely denticulate along the inner edge.

Habitat.—The larva described above was taken December 24, 1873, in the Southern Ocean, off Prince Edward Island.

Family 4. Mysidæ.

This family, the lowest in rank among the Schizopoda, comprises both littoral and pelagic forms, as also true deep-sea animals. In none of them is the slightest trace of true gills to be observed, and they are thereby very sharply defined from the three preceding families of Schizopoda, in which the gills are invariably well developed. In some forms, however, a peculiar folding of the integument, covered by the free parts of the carapace, can be discerned, and this structure may possibly stand in some relation to the respiratory function, though scarcely corresponding morphologically to the true gills in other Podophthalmia. I first called attention to this peculiar structure as early as the year 1867, when describing the fresh-water variety of *Mysis oculata*, Fabr. (*Mysis relicta*, Lovén),[1] and shall in the present Report describe a similar structure in the large deep-sea Mysidan, *Boreomysis scyphops*, G. O. Sars. Another appendage, peculiar to the males only, and issuing from the base of the inner branch of the pleopoda, may perhaps be also regarded as subservient to respiration. More especially in the males of the genus *Siriella*, Dana (*Cynthia*, Thompson), do these appendages present an appearance that strongly recalls that of true gills.

As a character common alike to all Mysidans, and sharply distinguishing them from other Schizopoda, may be mentioned the rudimentary state of the caudal limbs in the females, forming, as they do, very small setiferous lamellæ that have no relation whatever to locomotion, and thus have little or no claim to the term "pleopoda." This, in some genera, as *Mysis*, *Heteromysis*, *Mysidella*, also applies to the males. But in most of the genera the caudal limbs in the males are modified so as to assume the character of true natatory organs, being constructed in a manner similar to the pleopoda in the Lophogastridæ and Eucopiidæ.

The Mysidæ comprise numerous genera, most of which are met with in the Northern Ocean, and some of the species, as *Mysis oculata*, Fabr., are at times found crowded together in enormous shoals, thus serving as food for whales and other large vertebrates.

The Challenger collection comprises fifteen species of Mysidæ, belonging to eight genera, one of which is new.

[1] Histoire naturelle des Crustacés d'eau douce de Norvège, pt. i.

The following is a synopsis of the genera represented in the collection :—

- Number of incubatory lamellæ, composing marsupial pouch in female,
  - seven pairs. Male
    - greatly differing from female, having mandibular palp and gnathopoda remarkably modified, . *Petalophthalmus*, Suhm.
    - differing from female in the usual manner, chiefly as regards the structure of the caudal limbs, . *Boreomysis*, G. O. Sars.
  - two pairs only, with a rudiment of a third pair. Eyes
    - imperfectly developed, lamelliform. Legs
      - rather strong, with a distinct terminal claw, ... *Amblyops*, G. O. Sars.
      - remarkably slender, filiform, without any terminal claw, . . *Pseudomma*, G. O. Sars.
    - of the usual structure. Caudal limbs in male
      - natatory. Propodal joint of legs
        - non-subdivided or only bi-articulate, terminal claw very strong, . *Siriella*, Dana.
        - subdivided into three or more articulations. Antennal scale
          - remarkably small, . *Anchialus*, Kröyer.
          - lanceolate, setose on both edges, . *Mysidopsis*, G. O. Sars.
          - obliquely truncate at apex, outer edge smooth, . *Euchaetomera*, G. O. Sars.
      - rudimentary as in female, . . *Heteromysis*, Smith.

Genus 1. *Petalophthalmus*, Willemoes-Suhm, 1879.

Petalophthalmus, Suhm, Trans. Linn. Soc. Lond., ser. 2, vol. i.

Generic Characters.—Female exhibiting the usual Mysidan appearance; male very dissimilar, with mandibular palps prodigiously developed, and some of the limbs of the trunk also remarkably modified. Eyes in both sexes leaf-like, without any visual elements or pigment. Antennular peduncle greatly elongate in male, and without the usual hirsute lobe. Antennal scale lanceolate and setose on both edges. Gnathopoda in male very strong, subcheliform. Marsupial pouch in female composed of seven pairs of incubatory lamellæ. Caudal limbs of male scarcely natatory, inner branch simple, naked, styliform, outer non-articulate, slightly dilated in the middle, and having an oblique series of delicate bristles. Telson with apex entire, not incised in the middle. Outer plates of uropoda distinctly jointed at apex.

Remarks.—The remarkable form on which the above characterised genus has been based, exhibits, in the female, some affinity to the genus *Boreomysis*, G. O. Sars, the marsupial pouch being, as in that genus, composed of seven pairs of incubatory lamellæ, and the structure of the legs somewhat similar. Nevertheless, the very striking appear-

ance of the male at once distinguishes this genus from all other known Mysidans, the sexual characters being quite anomalous and differing from what is usually met with in this family. Moreover, the structure of the antennal scale and of the telson, as also that of the outer plates of the uropoda, would seem to afford well-marked characters, distinguishing this genus from the genus *Boreomysis*. As regards the imperfect development of the eyes, which has suggested the generic name, that character is also found in one of the species belonging to the above mentioned genus, viz., in *Boreomysis scyphops*, G. O. Sars, to be described in the sequel.

42. *Petalophthalmus armiger*, Willemoes-Suhm (Pl. XXXII. figs. 1–9).

Petalophthalmus armiger, Suhm, Trans. Linn. Soc. Lond., ser. 2, vol. i. p. 40, pl. viii.

Specific Characters.—Male: Body rather slender, well-nigh cylindrical in form. Carapace remarkably small and not nearly covering whole of trunk, two segments of which are entirely exposed; cervical sulcus well marked; frontal margin forming, in the middle, only a very small projection; antero-lateral corners narrowly rounded. Eyes forming two very thin oval lamellæ, supported on short pedicles. Antennular peduncle exceedingly slender, with basal joint longer than the two others taken together, flagella shorter than peduncle, subequal. Antennal scale narrow, lanceolate, projecting but slightly beyond basal joint of antennulæ; flagellum imperfectly developed, shorter than scale, biarticulate. Mandibular palp projecting beyond antennular peduncle, last joint reflexed and armed with seven strong spines. Maxillipeds short and thick, without exopodite, meral joint expanded interiorly to a linguiform lobe, terminal joint unguiform. Gnathopoda of a structure similar to maxillipeds, but much larger. The three anterior pairs of legs with last joint densely hirsute; remaining pairs very slender, with terminal part not subdivided, and having a distinct but feeble claw. Telson oblongo-quadrangular, apex broadly truncate, jutting out in the middle as a short dentiform projection, and having on either side five strong spines; lateral edges finely denticulate in the outer half. Terminal joint of outer plates of uropoda very sharply defined, linguiform. Length, 40 mm.

Remarks.—Of this interesting form I have only had opportunity of examining a single male specimen, apparently that described by the late Dr. v. Willemoes-Suhm. That author has also described the female; but the specimen from which his description was drawn up has unfortunately been lost. To judge from the figures given, it would seem to have presented a far less deviating appearance, resembling rather the species of the genus *Boreomysis*.

Description of the Male.—The specimen examined by me, which apparently is full-grown, measures 40 mm. in length.

The form of the body (see Pl. XXXII. fig. 1) is very slender and well-nigh cylindrical, without exhibiting any sharp demarcation between the anterior and posterior divisions.

The carapace is remarkably small, so as to cover only the anterior part of the trunk, whereas the two posterior segments of the latter are exposed behind it around the whole of their circumference. Moreover, the lateral wings of the carapace, in the specimen examined, were greatly inflected or doubled over, and thus the lateral parts of the two preceding segments also appear uncovered inferiorly. The carapace exhibits a well-marked cervical sulcus, behind which the linguiform dorsal area is distinctly seen. The frontal margin is truncate, with but a very small dentiform projection in the middle (see fig. 2) as a rudiment of the rostrum. The antero-lateral corners of the carapace are narrowly rounded.

The caudal segments are simple cylindrical, without any trace of epimera, the anterior ones differing but slightly in size and appearance from the two posterior segments of the trunk. The last segment, on the other hand, is rather elongate, about as long as the two preceding ones taken together.

The eyes (fig. 3) are quite rudimentary, without any trace either of pigment or visual elements, constituting merely two thin and pellucid lamellæ, of an oblong form, and mounted on very short and narrow pedicles. They would seem to a certain extent movable, and, in the specimen examined, were directed upwards, with their inner faces parallel to each other and to the axis of the body.

The antennular peduncle (see figs. 1, 2) is very slender and elongate, nearly equalling the carapace in length, and has the basal joint longer than both the others taken together. The last joint is rather small, and does not exhibit any trace of the hirsute lobe, usually met with in male Mysidans. The flagella are shorter than the peduncle, well-nigh uniform in structure and length, and composed of several short articulations.

The antennal scale (figs. 1, 2, 4) projects but slightly beyond the basal joint of the antennulæ, and exhibits a very narrow lanceolate form, the edges being densely setiferous all round. The flagellum is most imperfectly developed, and totally wants the terminal part, constituting, as it does, merely a short biarticulate stem, corresponding to the basal portion or peduncle in other Mysidans. This stem scarcely reaches to the tip of the scale, and is provided with a dense tuft of apical bristles.

The mandibular palps being, according to the statement of the late Dr. v. Willemoes-Suhm, of quite normal appearance in the female, exhibit in the male (see fig. 1) a truly remarkable development, projecting, as they do, in the form of a pair of very powerful limbs far beyond the antennular peduncles. Their middle joint is by far the largest and strongly muscular, and also furnished along the lower edge with numerous tufts of small bristles. The last joint is sharply reflexed, forming along with the preceding joint a geniculate bend, and is armed with seven strong unguiform spines, three of which spring from the apex, and two from each of the edges. These limbs serve in all probability as powerful prehensile organs, by the aid of which the male clasps the female during

copulation; but in no other Crustaceans has a similar modification of these limbs ever been observed.

As regards the structure of the mandibles themselves, and the maxillæ, we cannot of course give any reliable information, since these organs do not admit of being examined in the solitary specimen before us. In the female, their structure would seem, to judge from the description given by the late Dr. v. Willemoes-Suhm, to be on the whole quite normal.

The maxillipeds (fig. 6) are short and thickset in structure, without any trace of the usual exopodite, and want also, it would seem, the epipodite. They consist, however, of the usual number of joints, which together form a strongly curved stem. The meral joint is expanded interiorly to a rather large linguiform lobe, against which the outer part of the maxilliped admits of being impinged. The terminal joint has the form of a strong claw.

The gnathopoda (or first pair of legs) exhibit a structure much resembling that of the maxillipeds, though considerably larger and having the meral lobe comparatively more powerfully developed. No trace of an exopod can be detected, and the aspect of these limbs is, on the whole, very dissimilar from that of other Mysidans. In the female, however, to judge from the figure given by the late Dr. v. Willemoes-Suhm, they would not seem to exhibit any marked difference from that usually met with in Mysidans, and hence the peculiar modification both of these limbs and the maxillipeds in the male must certainly stand in some relation to the act of copulation.

Of the true legs, the two anterior pairs had been broken off in the specimen examined, their basal parts only, with the corresponding exopods, remaining intact. The third pair (see fig. 1) exhibit a form somewhat resembling that of the gnathopoda in other Mysidans, the terminal joint being not unguiform but obtuse and densely hirsute; and the two anterior pairs may, very probably, also have exhibited a similar appearance. The three remaining pairs of legs are exceedingly slender, and have the terminal part, or propodal joint, not subdivided, as in most other Mysidans, and the last joint modified to a distinct, though very feeble claw.

The caudal limbs (fig. 7) are not, as usual in the males of most other Mysidans, modified to natatory organs, or pleopoda, though somewhat dissimilar in structure from those in the female. They consist of a rather feeble basal part and two very unequal terminal branches. The outer of these forms merely a slender cylindrical simple appendage, without any armature whatever, whereas the inner branch is rather large and somewhat expanded in the middle, having there an obliquely transverse series of very delicate bristles, the terminal part tapering somewhat and furnished with two bunches of short bristles. Any distinct articulation cannot be detected in either of the branches.

The telson (fig. 8) is a trifle shorter than the last segment, and exhibits the form of an oblongo-quadrangular plate, being everywhere about of the same breadth and

broadly truncate at the apex. The lateral edges are in the outer half finely denticulate, and the apical edge juts forth in the middle as a short dentiform projection, on either side of which are affixed five strong spines (see fig. 9).

The uropoda (see fig. 8) have the inner plates of about the same length as the telson and narrowly lanceolate in form, whereas the outer plates are considerably larger, and clearly distinguished by the outer linguiform part being marked off from the plate by a very distinct articulation, a feature not observed in any other known form of Mysidans. The outer edge of the plate is quite smooth, and terminates as a distinctly projecting corner bearing a short spine, whereas the terminal articulation and also the whole inner edge of the plate is fringed with a dense row of ciliate setæ.

Habitat.—The above described specimen was taken in the Tropical Atlantic, at a very considerable depth. Locality: Station 104, August 23, 1873; lat. 2° 25′ N., long. 20° 1′ W.; depth, 2500 fathoms; Globigerina ooze; bottom temperature, 36°·6.

Genus 2. *Boreomysis*, G. O. Sars, 1869.

Boreomysis, G. O. Sars, Undersögelser over Christianiafjordens Dybvandsfauna.

Generic Characters.—Carapace rather large, covering most of trunk, antero-lateral corners produced, lobiform. Tail slender, cylindrical, with last segment longest. Antennular peduncle comparatively robust, with male appendage very short, tuberculiform; outer flagellum more or less distinctly expanded at base. Antennal scale elongate, sublinear; outer edge smooth, terminating in a dentiform projection. Last joint of mandibular palp narrowly oblong. Second pair of maxillæ with inner expansion of basal part very broad, terminal joint oval, with some of the bristles recurved. Gnathopoda elongate, with terminal joint very mobile and densely hirsute. Legs rather slender, subequal, with propodal joint subdivided into two or three articulations, terminal joint unguiform. Marsupial pouch in female composed of seven pairs of incubatory lamellæ. Caudal limbs in male all natatory, with very elongate branches. Telson large, deeply incised at apex. Outer plate of uropoda with a ledge-like prominence in front of the middle exteriorly, bearing two small denticles. Auditory apparatus at base of inner plate rudimentary.

Remarks.—This genus is distinguished from most other Mysidans by having the marsupial pouch of the female composed of seven pairs of incubatory lamellæ. In this character it agrees only with the preceding genus, from which, however, it may be easily recognised by a deviating structure of the antennular peduncle, the antennal scale, and the caudal fan, besides the male sexual characters, which in the present genus are quite normal, whereas in the former they are very peculiar and anomalous.

The typical species is *Boreomysis arctica* (Krøyer), first met with in the Arctic Sea,

off Greenland, and also occurring along the coasts of Norway, where two other species, *Boreomysis tridens*, G. O. Sars, and *Boreomysis megalops*, G. O. Sars, have been also observed. Moreover, on the Norwegian North Atlantic Expedition two large species were taken, *Boreomysis nobilis*, G. O. Sars, and *Boreomysis scyphops*, G. O. Sars, the latter of which is also represented in the Challenger collection. Finally, there are two additional species from the Challenger Expedition, to be described further on. The total number of species thus amounts to seven. All are true deep-sea forms, the animals descending to very considerable depths, and having never been met with in shallow water.

The following is a synopsis of the three Challenger species :—

Eyes	imperfectly developed, calyciform, without pigment or visual elements,	.	*B. scyphops*, G. O. Sars.
	of the usual structure, short and thick, almost circular, with cornea greatly expanded. Frontal margin obtusely rounded,	. . .	*B. obtusata*, G. O. Sars.
	of the usual structure, narrow, almost fusiform, with cornea very small. Frontal margin with a small pointed projection in the middle,	.	*B. microps*, G. O. Sars.

43. *Boreomysis scyphops*, G. O. Sars (Pl. XXXII. figs. 10–20).

Petalophthalmus inermis, Suhm MS.

Boreomysis scyphops, G. O. Sars, Crustacea et Pycnogonida nova in itinere 2do et 3tio Expeditionis Norvegicæ anno 1877–78 collecta, No. 3.

Boreomysis scyphops, G. O. Sars, The Norwegian North Atlantic Expedition, 1876–1878, Crustacea, i. p. 56, pl. vi.

Specific Characters.—Frontal part of carapace without any distinct rostrum, projecting but slightly in the middle ; antero-lateral lobes obtuse at apex. Eyes without pigment or visual elements, constituting two pedunculated concave, or well-nigh calyciform lamellæ, placed vertically. Antennular peduncle comparatively smaller than in the other species, and of more normal form. Antennal scale rather elongate, about twice as long as antennular peduncle, slightly tapering, denticle of outer corner somewhat projecting. Propodal joint of legs subdivided into two articulations only; exopods remarkably elongate, with terminal part composed of numerous articulations. Telson almost equalling in length the two preceding segments taken together, outer part slightly tapering, and fringed with numerous small denticles, apical incision narrow, occupying nearly one-fourth of the length of telson. Inner plate of uropoda reaching tip of telson, outer plate much larger. Colour a uniform pale red. Length reaching 85 mm.

Remarks.—This gigantic Mysidan was first met with on the Challenger Expedition in the subantarctic region of the Southern Ocean, and has been briefly recorded by the late Dr. v. Willemoes-Suhm under the provisional name of *Petalophthalmus inermis*. Subsequently the same form was obtained on the Norwegian North Atlantic Expedition

in the Arctic Sea, and has been more fully described by the author under the name of *Boreomysis scyphops*. Although the former appellation has without a doubt claim to priority, I have seen fit to retain that proposed by myself, for the following reasons:— First, it is obvious that the said form cannot properly be comprised within the same genus as the preceding anomalous Mysidan, the only characters peculiar to both being merely the rudimentary condition of the eyes, whereas in all other respects it agrees much more closely with the species of the genus *Boreomysis*, to which of course it should rightly be referred. Secondly, this admitted, the specific name *inermis* would be quite inappropriate, referring, as it does, to the absence in the male of similar prehensile organs as in *Petalophthalmus armiger*, such a peculiar prehensile apparatus being never found in any species of the genus *Boreomysis*. Thirdly, no description of this form has been given by the late Dr. v. Willemoes-Suhm, by whom the animal is only briefly recorded as a new species.

Although a full account of the present interesting Mysidan, with figures representing both sexes, has been given in the Report on the Crustacea collected on the Norwegian North Atlantic Expedition just published, I have deemed it advisable to append the following somewhat modified description of the Challenger form.

Description.—Most of the specimens in the collection are females, and of the two male specimens found, none is yet fully developed. The largest female specimen measures about 85 mm. in length from the tip of the antennal scale to that of the uropod, or still somewhat more than the arctic specimens collected on the Norwegian Expedition.

The form of the body (see Pl. XXXII. fig. 10) is somewhat robust, with the anterior and posterior divisions pretty well defined.

The carapace is rather large, covering the whole of the trunk, except a small part of the last segment, which appears exposed above. Moreover, the rounded lateral parts or wings of the carapace slightly overlap the first caudal segment. The cervical sulcus is very distinctly defined, marking off the cephalic section or frontal part of the carapace. The latter portion is evenly arched above, without any keel, and juts forth anteriorly in the middle as a slightly projecting angle. At the sides, the frontal margin forms, as in the other species, a deep emargination almost wholly exposing the basal part of the antennæ (see figs. 10, 11). Beneath this emargination each of the antero-lateral corners projects as a linguiform lobe, obtuse at the tip. The dorsal area is seen extending posteriorly behind the cervical sulcus as a narrow linguiform space, reaching to about the posterior third of the length of the carapace.

On removing the free parts of the carapace (see fig. 11) all the segments of the trunk are visible, as in the Lophogastridæ and Eucopiidæ, distinctly defined in their whole circumference, though densely crowded dorsally, in such a manner that only the last segment has the dorsal face of any considerable extent, whereas the others are extremely narrow, almost riband-shaped in that part. Laterally, each of the six anterior segments

produce a peculiar folding of their integument, increasing in breadth inferiorly and exhibiting here as it were an imbricate appearance. These peculiar cuticular folds, first noticed by the author when describing the fresh-water variety of *Mysis oculata*, Fabr. (*Mysis relicta*, Lovén), occur more or less distinctly developed in all Mysidans, and may to some extent compensate for the absence of true gills, these parts being constantly bathed by the current of water flowing beneath the free parts of the carapace, and chiefly produced by the oscillatory movements of the epipodite of the maxilliped that projects within the branchial cavity anteriorly.

The caudal segments are perfectly cylindrical, without the slightest trace of epimera, and somewhat less in breadth than the anterior part of the carapace. The last segment is much the longest, about twice as long as the preceding.

The eyes (fig. 13) exhibit nearly the same imperfect structure as in the genus *Petalophthalmus*, lacking, as they do, every trace of pigment and visual elements, and constituting merely simple lamellar or petaloid expansions, mounted in a vertical position on short pedicles. As to form, they differ somewhat from those in *Petalophthalmus armiger*, being distinctly hollowed on the outer face, or well-nigh calyciform, their aspect being almost as if the true eye-globe or cornea were extirpated, and only the skin of the pedicle left. Anteriorly they form a slight angular projection, being for the rest of a somewhat irregular oval form.

The antennular peduncle (see figs. 10–12) is comparatively smaller than in the other species of the genus, and has also a more regular cylindrical form, the second joint being simple and not discoidal or cup-shaped. The outer flagellum forms only a slightly defined expansion at the base.

The antennal scale (see fig. 12) is rather large, almost twice as long as the antennular peduncle, tapering toward the apex, which is obliquely rounded, with the outer corner somewhat projecting and dentiform.

The mandibles (fig. 14) exhibit the structure characteristic of the genus, the palp being rather elongate, with its terminal joint narrowly oblong.

The first pair of maxillæ (fig. 15) are also quite normal in structure and agree as regards all essential features with those organs in the other species of the genus.

The second pair of maxillæ (fig. 16) have the basal part rather large, forming inwards a slightly arched and sharp border, densely beset with delicate curving bristles. There are, as usual, three masticatory lobes densely crowded together at the inner corner of the basal part. The exognath is but of moderate size and elliptical in form, fringed with delicate plumose setæ along the outer edge. The terminal joint of the palp is oblong, and has the bristles of the outer edge recurved, as in the other species of the genus.

The maxillipeds (fig. 17) are not particularly powerful in development, and have the basal part of about the same length as the terminal or palp, projecting inward as a narrow, linguiform masticatory lobe. Of the joints of the palp the antepenultimate

(carpal) is the longest; the terminal joint is conically pointed and provided at the tip with a strong unguiform spine. The exopodite (see fig. 11) is very fully developed, in the same manner as the true exopods. The epipodite is narrowly lanceolate or almost falciform, and about as long as the basal part.

The first pair of legs (fig. 18) differ, as in other Mysidans, conspicuously from the rest, being modified to serve as true gnathopoda. They are rather elongate, with the carpal joint longest. The propodal joint, which, as a rule, forms along with the former a sharp geniculate bend, is somewhat dilated towards the end, exhibiting there, at the inner edge, a slight incurvation to receive the terminal joint when bent in. The latter is very small and densely hirsute, as also exceedingly mobile. The exopod is remarkably elongate, its terminal part consisting of a great number of short setiferous articulations.

The true legs are all of them uniform in appearance, somewhat slender and densely setiferous, more especially along their inner edge. The propodal joint (see fig. 19) is in all subdivided only into two articulations of unequal size, the proximal more than twice the length of the distal, and furnished with dense fascicles of setæ. The terminal joint has the form of a slender claw. The exopod is very greatly developed, and of precisely the same structure as in the gnathopoda.

The marsupial pouch of the female is composed, as in the other species of this genus, of seven pairs of incubatory lamellæ, originating from the bases of the gnathopoda (see fig. 18) and all of the true legs; they increase successively in size from before backwards (see fig. 11).

The telson (see fig. 20) is comparatively large, attaining almost the length of the two preceding segments taken together, and has the form of an oblong lamella, slightly channelled above and somewhat tapering in its outer part, which is edged with numerous small denticles of unequal size. The apex is deeply incised, the incision being very narrow, and occupying almost one-fourth of the length of the telson. The terminal lobes, limiting the incision, are obtusely pointed, and bear on the tip several denticles of unequal size, as also along their inner edge a dense fringe of fine spinules.

The uropoda (*ibid.*) have the terminal plates of very unequal size, the inner plate scarcely projecting beyond the telson, whereas their exterior plate is much larger and somewhat oblong in form, having, as in the other species, a small ledge-like projection at the outer edge, near the base. The auditory apparatus within the base of the inner plate would seem to be quite rudimentary, indeed well-nigh obsolete.

The nervous cord (see fig. 12) exhibits a structure somewhat differing from that described by the author in *Mysis relicta*. The ganglia of the anterior division of the body, exclusive of the brain or supra-œsophageal ganglion, are not, as in that Mysidan, connate, but distinctly defined, though lying, as it were, imbedded in a common sheet of connective tissue. On closer examination, eleven separate ganglia may be readily counted, connected together by very short double commissures; but these commissures

would not seem to be fibrous but rather of a similar cellular structure to that of the ganglia themselves. On the other hand, the ganglia of the tail are connected by very long and narrow, distinctly fibrous commissures, placed close together.

The colour of the animal, in a fresh state, as observed on the Norwegian North Atlantic Expedition, was a uniform pale red.

Habitat.—Several specimens of this magnificent Mysidan were collected on the Challenger Expedition in the Southern Ocean from very great depths. The following is a list of the Stations:—

Station 147, December 30, 1873; lat. 46° 16′ S., long. 48° 27′ E. (off Crozet Islands); depth, 1600 fathoms; Diatom ooze; bottom temperature, 34°·2.

Station 157, March 3, 1874; lat. 53° 55′ S., long. 108° 35′ E.; depth, 1950 fathoms; Diatom ooze; bottom temperature, 32°·1.

Station 158, March 7, 1874; lat. 50° 1′ S., long. 123° 4′ E.; depth, 1800 fathoms; Globigerina ooze; bottom temperature, 33°·5.

Distribution.—The geographical distribution of this form is very remarkable, ranging, as it does, within the limits of well nigh the same region in both hemispheres, and not occurring in the intermediate tracts of the ocean. As it cannot be reasonably assumed that the species has originated independently in both hemispheres, the physical condition of the sea-bottom must at some time or other have been more uniform than at present, to have admitted of the species spreading over a much more extensive area, whereas at a later period essential changes in the climatological conditions must be assumed to have caused this form to withdraw successively from the equatorial region towards the two poles, thus dividing the species into two widely separated stocks, inhabiting corresponding regions in both hemispheres. Another fact, too, viz., the remarkable occurrence, as stated above, of the northern form, *Lophogaster typicus*, M. Sars, in the Southern Ocean, without its being ever met with in the intermediate tracts, may also warrant the assumption of essential changes in the physical conditions of the sea-bed having taken place at some former period, thus causing the occurrence of certain species to appear discontinuous.

44. *Boreomysis obtusata*, G. O. Sars (Pl. XXXIII. figs. 1–6).

Boreomysis obtusata, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 42.

Specific Characters.—Male:—Anterior part of carapace not keeled above nor forming any distinct rostral projection, the frontal margin being broadly rounded, with but a very slight angle in the middle; antero-lateral lobes sharply pointed. Eyes well developed, rather short and broad, almost circular, cornea greatly expanded, with reddish pigment. Antennular peduncle rather stout, with second joint very short, discoidal. Antennal scale oblong, tapering, apex narrowly truncate, denticle of outer corner but slightly projecting. Propodal joint of legs subdivided into three distinctly defined articulations.

Telson somewhat narrowed in outer part, apical incision occupying scarcely one-fifth of the length of the telson, rounded at bottom; terminal lobes narrow, obtuse at tip. Length, 30 mm.

Remarks.—This species is nearly allied to the two northern species *Boreomysis nobilis*, G. O. Sars, and *Boreomysis tricornis*, G. O. Sars, but may at once be distinguished by the obtusely rounded frontal margin, that exhibits neither a distinct rostral projection, nor any trace of lateral processes.

Description.—Only two specimens—both adult males—are comprised in the collection, one of which is somewhat defective. The larger of the specimens measures 30 mm. in length.

The form of the body (see Pl. XXXIII. fig. 1) is somewhat short, nearly as in the Norwegian species *Boreomysis tricornis*, the tail only slightly exceeding in length the anterior division of the body.

The carapace is rather large, covering, as in the preceding species, the whole of the trunk, saving a very small part of the last segment that appears exposed above within the bottom of the posterior emargination. The anterior part, in front of the cervical sulcus, is evenly arched above, without any dorsal keel, and the frontal margin forms an almost even curve, without any distinct rostral projection, presenting but a very slight and inconspicuous angular prominence in the middle (see figs. 2, 3). The antero-lateral lobes are rather produced and sharply pointed at the tip.

The caudal segments are cylindrical, and, as usual in the males, rather thick and muscular, the last somewhat elongate, about as long as the two preceding taken together.

The eyes (see figs. 1, 2) are perfectly normal in structure, and rather short and thick, almost circular, and somewhat flattened, with the cornea greatly expanded and provided with a dark reddish pigment and well-developed visual elements.

The antennular peduncle (*ibid.*) is rather stout and somewhat similar to that in the typical species, the second joint being extremely short, almost discoidal. At the extremity of the peduncle, beneath the insertion of the flagella, is seen the male appendage, which is very short, tuberculiform, but furnished with a dense tuft of delicate sensory hairs.

The antennal scale (fig. 4) projects considerably beyond the antennular peduncle, without, however, attaining double its length. It is oblong-linear in form, tapering toward the apex, which is narrowly truncate, with the denticle of the outer corner but slightly projecting.

The legs are rather slender, and have all the propodal joints subdivided into three distinctly defined articulations (see fig. 5), the first of which is much the largest, and provided at the inner edge with several bunches of slender setæ. The exopods are, as usual in the males, very powerfully developed, having the basal part broad and compressed; they do not by any means, however, attain such a remarkable length as in the preceding species.

The caudal limbs are developed precisely as in the males of the other species of the genus, constituting powerful natatory organs, with very elongate and multiarticulate branches. In the first pair, however, the inner branch is, as usual, non-articulate, forming an oblong membranous plate, with a short lateral expansion at the base.

The telson (fig. 6) is a trifle longer than the last segment and somewhat slender, as compared with that of the preceding species, with the outer part narrowed and densely fringed with small, slightly unequal, denticles. The apical incision does not fully occupy one-fifth of the length of the telson, and is narrowly rounded at the bottom, as also fringed with numerous short spinules. The terminal lobes are somewhat narrow and obtusely rounded at the tip, and their apical denticles would not seem to exceed in length the lateral.

The uropoda exhibit much the same appearance as in the two Norwegian species *Boreomysis arctica* and *Boreomysis tricornis*, having both plates somewhat more slender than in *Boreomysis scyphops*.

Habitat.—The two specimens contained in the collection were both taken in the North Pacific in the following localities :—

Station 232, May 12, 1875; lat. 35° 11′ N., long. 139° 28′ E. (off coast of Japan); depth, 345 fathoms; green mud; bottom temperature, 41°·1.

Station 252, June 12, 1875; lat. 37° 52′ N., long. 160° 17′ W.; depth, 2740 fathoms; red clay; bottom temperature, 35°·3.

45. *Boreomysis microps*, G. O. Sars (Pl. XXXIII. figs. 7–10).

Boreomysis microps, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 43.

Specific Characters.—Female :—Form of body somewhat more slender than in the preceding species. Frontal margin of carapace arched, with a small pointed projection in the middle. Last caudal segment elongate, tapering. Eyes unusually narrow, almost fusiform, with cornea not in the least expanded, and occupying but a small part of the eye. Antennular peduncle relatively more slender than in *Boreomysis obtusata*. Antennal scale surpassing antennular peduncle by only one-fourth of its length, oblong-linear, apex obtusely truncate, with denticle of outer corner very small. Telson exceedingly slender and greatly narrowed in outer part; lateral edges armed with strong denticles along with numerous much smaller ones; apical incision occupying only from one-seventh to one-eighth of the length of telson, very narrow at bottom; terminal lobes rounded at tip. Length, 24 mm.

Remarks.—The present form may be at once distinguished from the other species of the genus by its unusually small and narrow eyes, a character from which the specific denomination was taken. Moreover, the slender form of the telson would seem to afford a good specific mark.

Description.—Only one specimen, a broken adult female, is comprised in the collection. It has a length of 24 mm., and is thus somewhat smaller than the last species.

The form of the body (see Pl. XXXIII. fig. 7) would appear to be a trifle more slender than in the last species, and the tail is in particular relatively more elongate, as compared with the anterior division.

The carapace is rather large, and exhibits the usual form, with the cervical sulcus very strongly marked, and the posterior edge evenly emarginate in the middle, exposing above a small portion of the last segment of the trunk. The frontal margin (see fig. 8) is evenly arched at the sides, and exhibits in the middle a small pointed projection, the rudiment of a rostrum.

The tail tapers somewhat backwards, and has the last segment very elongate, exceeding in length the two preceding segments taken together.

The eyes (see fig. 8) are comparatively small, and exhibit a form somewhat differing from that in the other species, being narrowly clavate, or almost fusiform, with the cornea not in the least expanded, and occupying but a very small part of the eye. The ocular pigment is, as in the last species, of a reddish colour.

The antennular peduncle (*ibid.*) is somewhat more slender than in *Boreomysis obtusata*, though in other respects exhibiting the usual structure.

The antennal scale (*ibid.*) is less produced than in the two preceding species, projecting, as it does, beyond the antennular peduncle by only one-fourth of its length. It has an oblong-linear form, with the greatest breadth about in the middle, and the apex obtusely rounded, with the denticle of the outer corner very small.

The legs would seem to agree in structure perfectly with those in *Boreomysis obtusata*.

The telson (fig. 9) is exceedingly slender and elongate, exceeding perceptibly in length the last segment, and has the outer part much narrowed. The lateral edges are in the greater part of their length armed with rather strong denticles, having between them a great number of much smaller ones. The apical incision is comparatively short, occupying only from one-seventh to one-eighth of the length of the telson, and rather narrow, having, however, at the bottom a peculiar dilatation (see fig. 10). The edges of the incision are, as usual, coarsely spinulose, and the terminal lobes rounded at the tip.

Of the uropoda the outer plates had been broken off in the specimen examined; the inner plates were very slender, lanceolate, and projected perceptibly beyond the tip of the telson.

Habitat.—The sole specimen described above was taken in the North Atlantic south of Nova Scotia, United States:—

Station 50, May 21, 1873; lat. 42° 8′ N., long. 63° 39′ W.; depth, 1250 fathoms; blue mud; bottom temperature, 38°·0.

Genus 3. *Amblyops*, G. O. Sars, 1872.

Amblyops, G. O. Sars, Monographi over Norges Mysider, Bd. ii.

Generic Characters.—Form of body comparatively thickset. Carapace large, covering greater part of trunk, frontal margin evenly arched, without any trace of a rostral projection. Eyes imperfectly developed, transformed into two immobile plates, extending horizontally in front of the carapace and contiguous in the middle. Antennular peduncle short and thick, with last joint largest; male appendix well developed. Antennal scale with outer edge naked, and jutting out at the end as a dentiform projection. Oral parts of usual structure. Gnathopoda having endopod comparatively poorly developed. Legs subequal, of moderate length, propodal joint subdivided into three articulations, terminal joint unguiform. Marsupial pouch composed of but two pairs of distinctly developed incubatory lamellæ. Sexual appendages in male short and thick, with a transverse row of curved apical bristles. Caudal limbs in male natatory. Telson linguiform, not incised at apex, outer part coarsely spinous at edges. Inner plate of uropoda much shorter than outer.

Remarks.—Of this genus, which is closely allied to the genus *Pseudomma*, G. O. Sars, a single species only, *Amblyops abbreviata*, G. O. Sars, from the Norwegian coast, has hitherto been recorded. Another form, evidently belonging to the same genus, has, however, been taken on the Challenger Expedition in the southern hemisphere, and will be described below.

46. *Amblyops crozetii*, Willemoes-Suhm. MS. (Pl. XXXIII. figs. 11–16).

Amblyops crozetii, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 44.

Specific Characters.—Male:—Form of body somewhat more slender than in the typical species. Carapace almost entirely covering trunk, antero-lateral corners obtusely truncate. Last caudal segment somewhat longer than preceding. Ocular plates rather large, quadrilateral, with a small upturned papillary projection anteriorly. Antennal scale scarcely twice the length of antennular peduncle, somewhat rhomboidal, denticle of outer corner placed well-nigh in the middle of the length of the scale, inner corner projecting as a narrow linguiform lobe. Legs rather slender, terminal part very narrow, with first joint longer than both the others taken together. Telson relatively short, scarcely as long as last segment; apex broadly truncate, and armed with numerous strong spines. Inner plate of uropoda projecting considerably beyond tip of telson, and about half as long as outer; auditory apparatus imperfectly developed. Length, 29 mm.

Remarks.—This form has been briefly recorded by the late Dr. v. Willemoes-Suhm in his manuscript notes, as a new species, under the above appellation, and a drawing

furnished of the animal viewed from above. It may at once be distinguished from the typical species, *Amblyops abbreviata*, G. O. Sars, by the deviating form of the antennal scale and the telson, as also by the remarkably slender legs.

Description.—Only a single specimen of this form, an adult male, was procured on the Expedition. It has a length of 29 mm., and thus considerably exceeds in size the typical species, which attains a length of only 18 mm.

The form of the body (see Pl. XXXIII. figs. 11, 12) is comparatively rather robust, though somewhat less so than in the typical species, with the anterior division but slightly more dilated than the posterior.

The carapace is rather large, covering most of the trunk, and leaving but a small part of the last segment exposed above. The anterior part is marked off by a well-defined cervical sulcus, and somewhat arched above, with the frontal margin forming in the middle a perfectly even curve. The antero-lateral corners of the carapace are obtusely truncate, and the inferior margins rather incurved in the middle.

The tail is cylindrical and anteriorly only a trifle narrower than the anterior part of the carapace. The five anterior segments are nearly uniform in length, whereas the last is rather elongate, almost as long as the two preceding taken together.

The ocular plates are comparatively large, occupying, as they do, the whole breadth of the frontal margin, and are perfectly well defined from each other, though contiguous along their inner edge. They exhibit an irregular quadrilateral form, with the inner side shortest, and forming a right angle with the anterior, which has a short, somewhat upturned, papillary projection in the middle. The edges of the plates are quite smooth, and no trace of any pigment or visual elements could be detected in the specimen examined; though a similar diffuse pink pigment, as in the typical species, may have existed in the specimen, when still fresh.

The antennular peduncle is short and thick, with the terminal joint as large as the two others taken together. The male appendage is comparatively shorter than in the typical species, but furnished with a dense bunch of delicate bristles. The flagella were broken off at a short distance from their bases.

The antennal scale (fig. 13) exhibits an appearance somewhat different from that in the typical species, and is also relatively somewhat shorter, attaining scarcely twice the length of the antennular peduncle. It is somewhat rhomboidal in form, the apex being very obliquely truncate, with the inner corner greatly projecting as a narrow linguiform lobe fringed round with long setæ, whereas the outer corner juts out as a strong dentiform projection, placed almost in the middle of the length of the scale. The basal part of the flagellum is but half as long as the scale, with the middle joint longest; the terminal part was broken in the specimen examined.

The legs (figs. 14, 15) are rather more slender than in the typical species, and very narrow, especially the posterior ones (fig. 15), though still exhibiting the structure

characteristic of the genus, the terminal part being subdivided into three articulations, the first by far the longest, and having besides a distinct, though rather small terminal claw. The exopods are very strongly developed, with exceedingly broad and muscular basal parts.

The caudal limbs are also very powerful, natatory, and agreeing in structure with those in the male of *Amblyops abbreviata*.

The telson (fig. 16) is rather short, attaining scarcely the length of the preceding segment, and differs conspicuously from that in the typical species by the apex being abruptly and broadly truncate, and even slightly emarginate in the middle, not as in that species narrowly rounded. It tapers very slightly, and has the outer part fringed with numerous small denticles, those springing from the apical edge, about fourteen, being somewhat more elongate. Moreover, in the middle of the apical edge is seen a small tubercle, from which issue two slender and diverging setæ.

The uropoda exhibit the usual structure, and have the outer plate rather large, almost twice the length of the inner. The latter is lanceolate, and projects considerably beyond the tip of the telson. The auditory apparatus at the base of this plate would seem to be quite rudimentary, whereas in the typical species it is well developed.

Habitat.—The above described specimen was taken in the Southern Ocean off the Crozet Islands, at a rather considerable depth. The locality is as follows :—

Station 147.—December 30, 1873 ; lat. 46° 16′ S., long. 48° 27′ E. ; depth, 1600 fathoms ; Diatom ooze ; bottom temperature, 34°·2.

Genus 4. *Pseudomma*, G. O. Sars, 1869.

Pseudomma, G. O. Sars, Nye Dybvands—Crustaceer fra Lofoten ; Christiania Vid. Selsk. Forhandl., 1869.

Generic Characters.—Form of body slender, almost cylindrical throughout. Carapace small, not covering by far the whole trunk, frontal margin evenly arched, without any rostral projection. Eyes quite rudimentary, forming merely broad petaloid expansions of the ocular segment, partly connate in the middle, and not exhibiting the slightest trace of pigment or visual elements. Antennular peduncle very short ; male appendage large, conical. Antennal scale more or less obliquely truncate, with inner corner projecting, outer jutting forth as a strong dentiform process. Gnathopoda having endopod powerfully developed, with terminal joint densely hirsute. Legs exceedingly slender and fragile, filiform, increasing in length posteriorly ; propodal joint subdivided into three articulations, terminal joint obtuse and densely hirsute, not unguiform. Sexual appendages of male very narrow, with a single apical bristle. Caudal limbs in male all natatory. Telson linguiform, with apex entire, apical spines elongate. Inner plate of uropoda shorter than outer, with auditory apparatus distinctly developed.

Remarks.—Of this genus, chiefly distinguished by the peculiar rudimentary condition

of the eyes and the extremely slender filiform legs, three northern species have been recorded, viz., *Pseudomma roseum*, G. O. Sars, *Pseudomma affine*, G. O. Sars, and *Pseudomma truncatum*, Smith. Two additional species, to be described below, were met with on the Challenger Expedition, both in the southern hemisphere. They are readily distinguished from each other by the form of the ocular plates and the antennal scale, as follows :—

Ocular plates with upper face plane and outer edge serrate. Antennal scale oblong, with inner corner only slightly projecting; spine of outer corner far removed from base, ... *P. sarsii*, Suhm.

Ocular plates divided by a longitudinal ridge, outer edge smooth. Antennal scale lanceolate, with inner corner greatly projecting; spine of outer corner placed close to base, ... *P. australe*, G. O. Sars.

47. *Pseudomma sarsii*, Willemoes-Suhm. MS. (Pl. XXXIV. figs. 1–3).

Pseudomma sarsii, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 46.

Specific Characters.—Form of body very slender. Carapace evenly emarginate behind, leaving the two posterior segments of trunk uncovered above. Last caudal segment longer than preceding. Ocular plates occupying almost the whole breadth of frontal margin, obtusely truncate anteriorly, outer edge partly serrate, upper face plane. Antennal scale oblong, with denticle of outer corner not far distant from apex, inner corner but slightly projecting and bluntly rounded. Telson about as long as last segment, linguiform, apex broadly rounded and armed with ten strong spines, the six innermost rather long; lateral denticles very small. Uropoda of usual structure. Length, 14 mm.

Remarks.—This form was recorded by the late Dr. v. Willemoes-Suhm in his manuscript notes, under the above given name, and a figure added of the animal as viewed from above. It is closely allied to the typical species, *Pseudomma roseum*, G. O. Sars, or perhaps still more to the Arctic form, *Pseudomma truncatum*, Smith, but may readily be distinguished from both by a somewhat deviating form of the antennal scale and by the armature of the telson.

Description.—The usual length of this form would seem to be about 14 mm., or somewhat less than that of *Pseudomma roseum*. There is, however, in the collection a single very mutilated specimen from the Antarctic Ocean, which is rather larger in size.

The form of the body (see Pl. XXXIV. fig. 1) is very slender, and rather similar to that of *Pseudomma roseum*, being nearly cylindrical throughout, with the anterior division but slightly dilated.

The carapace is comparatively small and narrow, not nearly covering the whole

trunk, two segments of which are partly exposed behind the posterior emargination. The anterior third part of the carapace is marked off by a well-defined and rather deep cervical sulcus, and terminated with an evenly-arched frontal margin. The antero-lateral corners are but very slightly produced, and obtuse-angled.

The tail is about twice as long as the carapace, and very slender, cylindrical, tapering scarcely at all posteriorly, with the last segment much longer than the others.

The ocular plates are comparatively broad, and quite plane, extending horizontally in front of the carapace, and occupying nearly the whole breadth of the frontal margin. They are obtusely truncate in front, and separated in the middle by a very small cleft. The outer edge is slightly arcuate, and finely serrate along its anterior part, forming, together with the anterior edge, an obtuse angle. As in the other species, no trace of pigment or any visual elements can be detected; but the optic nerve forms, within the ocular plate, a ramification exactly similar to that described by the author in *Pseudomma roseum*.

The antennular peduncle exhibits the usual form, being very short and thick, with the last joint longer than the two others taken together. The male appendage is somewhat shorter than the last joint of the peduncle, and provided with the usual dense bunch of hairs.

The antennal scale (fig. 2) is about twice as long as the antennular peduncle, and of an oblong form, about three times as long as broad. The apex is somewhat obliquely truncate, though not nearly to such an extent as in the other known species, and the inner corner therefore appears but slightly produced and bluntly rounded. The denticle of the outer corner is rather strong, and placed much nearer to the apex of the scale than in any of the other species.

The endopodal parts of the legs, as also the terminal parts of the antennular and antennal flagella, were broken off in all the specimens preserved.

The telson (fig. 3) has about the length of the last caudal segment, and exhibits a somewhat linguiform shape, being broadest at the base and tapering regularly toward the apex, which is broadly rounded or almost truncate. The lateral edges are armed in their outer part, on either side, with about eight very small denticles, and from the apical edge issue ten much larger denticles, increasing in size inwards, and assuming the character of strong spines; moreover, a small tubercle occurs in the middle, as in the other species, bearing two very delicate and diverging bristles. As regards form, the telson of the present species bears most similarity to *Pseudomma truncatum*, Smith, but in that species the number of the terminal spines is much less, viz., not over six. *Pseudomma affine*, G. O. Sars, on the other hand, has no less than twelve terminal spines, but in that form the apical edge is not distinctly defined from the lateral ones.

The uropoda exhibit the usual form, and have the auditory apparatus within the base of the inner plates distinctly developed.

Habitat.—Of this form, which may be regarded a representative species of the genus in the southern hemisphere, several specimens were collected off the Kerguelen Islands, at a depth of 120 fathoms. A single and much larger, though rather mutilated specimen, apparently of the same species, was taken in the Antarctic Ocean from a rather considerable depth. The locality is:—

Station 153, February 14, 1874; lat. 65° 42′ S., long. 79° 49′ E.: depth, 1675 fathoms; blue mud.

48. *Pseudomma australe*, G. O. Sars (Pl. XXXIII. figs. 17, 18).

Amblyops australis, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 15.

Specific Characters.—Ocular plates comparatively smaller than in the preceding species, not occupying the whole breadth of the frontal margin, outer edge smooth, and forming, along with anterior, a projecting corner, from which a longitudinal keel runs across the plate, dividing it into an upper and a lateral area, the latter somewhat hollowed. Antennular peduncle short and robust. Antennal scale twice the length of the antennular peduncle, rather narrow, lanceolate, setose on both edges, spine of outer margin placed close to base of scale.

Remarks.—Of this species only a fragment—the most anterior part of the body—was found in the collection. This fragment shows, however, some very striking peculiarities, fully warranting the establishment of a new species. I formerly referred it to the genus *Amblyops*, but now find it, on closer examination, more properly referable to the genus *Pseudomma*, the structure of the ocular plates being more in accordance with that in the latter genus.

Description.—The fragment—comprising the anterior part of the carapace, together with the ocular plates, the antennulæ and antennæ—had evidently belonged to a full-grown male specimen. The length of the animal may have probably been about 10 mm.

The carapace is rather broad anteriorly, with the frontal margin forming an even curve, and the antero-lateral corners almost right-angled.

The ocular plates (see fig. 17) do not occupy the whole breadth of the frontal margin, and exhibit, moreover, a form somewhat deviating from that in the preceding species. They are, as in that species, truncate anteriorly, and partly separated in the middle by a short and narrow sinus or cleft, but have the outer edge quite smooth, and forming, along with the anterior edge, a somewhat projecting corner. From the latter a longitudinal keel runs across the plate dividing it into an upper part, which is nearly plane, and a lateral one, distinctly hollowed along the middle (see fig. 18). As in the preceding species, no trace whatever of pigment or any visual elements can be detected.

The antennular peduncle has much the same appearance as in the last species, being

comparatively short and thick, with the last joint by far the largest. The male appendage also exhibits a very similar aspect.

The antennal scale (see fig. 17), on the other hand, looks very dissimilar, resembling rather that occurring in the species of the genus *Mysidopsis*. It is about twice as long as the antennular peduncle, and exhibits a very narrow, lanceolate form, with both margins apparently fringed with setæ in their whole length. On closer examination, however, a dentiform projection is seen issuing from the outer edge, at a very short distance from the base, and the part of the edge behind this projection does not exhibit any setæ. Thus, the scale is, in reality, formed upon the same type as that in the other species of the present genus, but is truncate obliquely to such an extreme degree, that the inner linguiform-produced corner occupies well nigh the whole length of the scale, whereas the outer corner has withdrawn to very near the base. The basal part of the flagellum is somewhat more produced than in the preceding species, being not much shorter than the scale, and has the last joint the longest. The terminal part of both this flagellum and those of the antennulæ had been broken off near their bases.

Habitat.—The above-described fragment I found in a bottle containing several larvæ of Decapoda and other Crustacea, taken off the entrance to Port Philip, Bass Strait. The locality is given below, as follows :—

Station 161, April 1, 1874 ; lat. 38° 22′ S., long. 144° 36′ E.; depth, 33 fathoms ; sand.

Genus 5. *Anchialus*, Kröyer, 1861.

Anchialus, Kröyer, Nat. Hist. Tidsskr., 2den Række, Bd. i.

Generic Characters.—Form of body somewhat different in the different species. Carapace more or less developed, with frontal margin produced in the middle. First caudal segment in female with small horizontally projecting epimera. Eyes normally developed. Antennular peduncle with male appendage very small, tuberculiform ; outer flagellum forming a lamellar expansion at base. Antennal scale remarkably small, shorter than basal part of flagellum, apex obliquely truncate. Legs subequal, densely setiferous, with terminal part subdivided into a more or less considerable number of short articulations, terminal claw quite obsolete. Caudal limbs in female partly obsolete, in male well developed, natatory. Telson large, incised at apex. Inner plate of uropoda scarcely shorter than outer ; auditory apparatus distinctly developed.

Remarks.—This genus, first established by Kröyer, is chiefly characterised by the rudimentary condition of the antennal scale, the presence in the female of a pair of small but distinct epimera on the first caudal segment, and the peculiar reduction of some of the caudal limbs in the female, finally by the form and large size of the telson. Besides the three species described below, a fourth, *Anchialus agilis*, has been recorded by the

author from the Mediterranean. The species of this genus would seem to lead a pelagic existence, most of them being met with at the surface of the sea.

The following is a synopsis of the Challenger species :—

Carapace with posterior edge	straight.	Frontal plate abruptly truncate,	*A. typicus*, Kroyer.
	emarginate, exposing	the two posterior segments of trunk. Frontal plate triangular, acutely pointed at tip,	*A. augustus*, G. O. Sars.
		none of the segments of trunk. Frontal margin only slightly projecting in the middle,	*A. pusillus*, G. O. Sars.

49. *Anchialus typicus*, Kröyer (Pl. XXXIV. figs. 4–24).

Anchialus typicus, Kröyer, Et Bidrag til Kundskab om Krebsdyrfamilien Mysidæ; Nat. Hist. Tidsskr., 2den Række, Bd. i. p. 53, Tab. ii. figs. 7, *a–l*.

Mysis maebii, Dohrn, Untersuchungen über Bau und Entwickelung der Arthropoden, II.; Zeitschr. f. wiss. Zool., Bd. xxi., 1871, p. 359, Tab. xxvii., xxviii. figs. 11–22.

Anchialus truncatus, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 47.

Specific Characters.—Form of body short and thickset. Carapace large, covering whole of trunk, posterior margin straight. Frontal plate abruptly truncate at tip. Last caudal segment a trifle longer than preceding. Eyes thick, claviform, cornea slightly expanded, with light yellowish pigment. Antennular peduncle short and stout, with middle joint cup-shaped. Antennal scale exceedingly minute, rhomboidal, denticle of outer corner obsolete. Gnathopoda very strong, with carpal joint in male projecting at the inner edge as a pointed process. Legs comparatively short, with terminal part very small, and divided into four to five articulations; first pair in male having terminal part dilated in the middle and armed with peculiar slender spines. Caudal limbs in female distinctly developed on first segment only, those of male, strong, with basal lobe of inner branch very broad, lamellar; outer branch of fourth pair but slightly produced. Telson very large, oblong linear, apical incision occupying one-seventh of the length. Uropoda with inner plate somewhat larger than outer, and having the auditory apparatus but slightly developed; outer plate with exterior edge armed with a row of small denticles. Marginal setæ of both plates very small. Length, 9 mm.

Remarks.—I recorded this form in my Preliminary Notices as a new species under the name of *Anchialus truncatus*, but now believe it to be identical with the *Anchialus typicus* of Kröyer. The figures given by that author do not, it is true, correspond exactly with the form examined by myself; but I think this may be merely accounted for by the imperfect drawings given by Kröyer. His description would seem, for the most part, to accord with the present species. I cannot but believe that the form recorded by Dohrn as *Mysis maebii* belongs to this species. As regards the Mediterranean species, *Anchialus agilis*, G. O. Sars, the similarity to the present form, both in the

external appearance and the structural details, is very striking. But, as the frontal plate exhibits in both a totally different form, and the eyes, moreover, in the present form have a very light pigment, whereas it is dark in the Mediterranean form, I prefer nevertheless to regard both as distinct, though very closely allied species.

Description.—The length of the body of the adult female is about 9 mm., that of the male somewhat less.

The form of the body (see Pl. XXXIV. figs. 4–6) is remarkably short and thickset, with the anterior division rather dilated, the posterior much more slender and cylindrical in form.

The carapace is comparatively very large, covering, besides the whole of the trunk, also the anterior part of the first caudal segment. Its posterior margin, contrary to what generally occurs in the Mysidæ, is quite straight, without exhibiting the slightest trace of the usual emargination in the middle; and the lateral parts or wings are very deep posteriorly, with their edges forming a strong curve. Anteriorly the carapace tapers somewhat, and exhibits here the usual cervical sulcus, which is, however, not particularly deep. The frontal margin juts forth in the middle as a rather broad, horizontally extending plate, abruptly truncate at the tip (fig. 7), not, as in the Mediterranean species, acutely pointed. The antero-lateral corners of the carapace are but slightly produced and almost right angled.

The first caudal segment exhibits in the female (see figs. 4, 5), on either side, a narrow plate, arching over the corresponding limbs, and apparently representing a kind of epimera. These plates are, however, wanting in the male (fig. 6). The other segments are simple cylindrical, and the last of them somewhat longer than the rest.

The eyes are comparatively short and thick, claviform, with the cornea slightly expanded, and occupying about the outer half of the eye. The ocular pigment in all the Challenger specimens, as also in those examined by Kröyer, is very light yellowish, whereas in the Mediterranean form it is of the usual dark hue.

The antennular peduncle (fig. 8) is rather thick and somewhat dilated toward the end, with the second joint exhibiting a rather peculiar, as it were, cup-shaped form, being apparently hollowed out anteriorly to receive the base of the terminal joint. The latter is about as long as the basal, and exhibits in the male on the lower face a very short knob-shaped lobe, clothed with a dense bunch of delicate hairs. Of the flagella, the outer, as usual, is the longer, and exhibits at the base a short lamellar expansion bearing a dense row of curved sensory bristles.

The basal part of the antennæ (see fig. 9) is rather thick and massive, and armed interiorly, at the base of the flagellum, with a strong denticulate spine. The scale, on the other hand, is exceedingly small, so as scarcely to be visible when the animal is viewed from above (fig. 5). It exhibits a somewhat rhomboidal form, the apex being obliquely truncate, with the inner corner slightly projecting and rounded off, the outer

forming an obtuse angle, without any distinct tooth. The proximal part of the flagellum projects widely beyond the scale, and has the middle joint by far the largest, the last very short.

The anterior lip (fig. 10) is chiefly distinguished by its projecting anteriorly as an exceedingly long and sharply pointed spine, denticulate at the edges.

The posterior lip (fig. 11) has its terminal lobes narrowly rounded in front, and finely ciliate at the tip.

The mandibles (fig. 12) are developed in the usual manner, and have the armature of their cutting edges (fig. 13) rather strong and somewhat different on the two mandibles. The palp (see fig. 12) is rather large, with the middle joint lamellar, the last of oval form and furnished with a double row of delicate bristles.

The first pair of maxillæ (fig. 14) have the outer dentiferous lobe sharply incurved, with a slight angular bend in the middle; the inner lobe is rather small and quite membranous, bearing at the edge several strong setæ. The exognath is distinctly visible in the form of a narrow lamellar expansion of the basal part, densely ciliate at the edge.

The second pair of maxillæ (fig. 15) exhibit quite a normal structure. The last joint of the palp is comparatively small and of an oval form, with the outer edge naked. The exognath is rather large, elliptical, and fringed with about thirteen strong plumose setæ, the posterior of which issues at some distance from the rest, and is more sharply curved.

The maxillipeds (fig. 16) are very strong, with the basal section clearly composed of two very broad segments—the coxal and basal,—the former bearing exteriorly the lanceolate epipodite, the latter exteriorly the exopodite, interiorly the strongly curved, five-jointed endopodite, or palp. The terminal joint of the latter is very small and armed with a strong curved claw; the four others are nearly uniform in size. No true masticatory lobe can be detected at the inner corner of the basal section.

The gnathopoda (fig. 17) exhibit quite an unusually robust structure, especially in the male, and bear a much closer resemblance to the maxillipeds than to the true legs. The basal part is very broad and muscular, and the carpal joint exhibits in the male a strong triangular expansion of the inner edge, to which the terminal part admits of being opposed.

The true legs (fig. 19) are comparatively short, and in the female uniform in structure, with the terminal part remarkably small, not attaining by far the length of the preceding (carpal) joint, and composed of only four articulations, the last of which is quite rudimentary and almost hidden between the bristles issuing from the preceding articulation; in the posterior pair this part (fig. 20) is a trifle more elongate, and has one articulation more than in the rest. In the male the first pair of legs (fig. 18) are peculiarly modified, the terminal part being rather dilated in the middle, and bearing

from ten to twelve peculiar slender spines, forming together a dense fascicle. In all the legs the basal part is rather fully developed and muscular, and the exopod very powerful, with broad and lamellar basal section and eleven-articulated terminal part.

The marsupial pouch in the female specimens (figs. 4, 5) was very large and protruding, and filled with numerous ova or embryos. It is composed of three pairs of incubatory lamellæ, originating from the bases of the three posterior pairs of legs. Of these lamellæ, the anterior pair are rather small, whereas the posterior are exceedingly large and curved.

The outer sexual appendages of the male (fig. 21) are slightly curved, and have at the tip a transverse row of small sharply curved bristles.

Of the caudal limbs in the female, only the first pair (see fig. 22) are developed in the usual manner, having the form of narrow stems, somewhat geniculate in the middle, and supplied with a few short bristles. On the four succeeding segments the limbs are represented by broad, immobile plates, contiguous in the middle, and closely applied to the ventral face, so as easily to be overlooked. These plates, which appear merely as expansions of the sternal parts of the segments, have their edges somewhat angular, and fringed with a few small bristles and short denticles.

In the male, all of the caudal limbs are modified to powerful natatory organs, with broad and muscular basal parts and multiarticulate setiferous branches, the inner of which exhibits at the base a remarkably broad and lamellar lateral expansion. In the first pair (fig. 23) the terminal part of the inner branch is wholly wanting, but its lamellar expansion still remains in its place. The fourth pair (fig. 24) are distinguished by the outer branch being somewhat more produced than in the other pairs, and having the outer articulations armed with short spines, instead of the usual natatory setæ; the antepenultimate articulation of this branch is, moreover, produced on the outer side as an acute-angled process (see fig. 25).

The telson (fig. 26) is very large, fully as long as the two preceding segments taken together, and exhibits an elongate, almost linear form, its length being about three times as great as its breadth. The lateral edges are almost quite straight and parallel, and armed with a great number of small denticles, more crowded in the outer part. The apex is cleft in the middle by a rather narrow incision, occupying about one-fifth of the length of the telson, and the terminal lobes are obtusely pointed and provided at the tip with a single denticle somewhat stronger than the lateral ones; their inner edges are throughout fringed with very fine spinules.

The uropoda (fig. 27) are highly distinguished by the very slight development of the marginal setæ on the terminal plates, whereas both of the latter are partly spinous at the edges. The inner plate is somewhat larger than the outer, and reaches the tip of the telson; it tapers regularly toward the apex, without exhibiting any conspicuous tumefaction at the base, owing to the very slight development of the auditory apparatus; its

inner edge is coarsely spinous throughout, the spines being somewhat unequal in size, and more especially the two apical ones rather large. The outer plate exhibits a form very similar to that of the inner, but is somewhat shorter, and has the outer edge fringed with a row of rather small, equal-sized denticles, the posterior of which, however, issuing from the tip of the plate, is somewhat stronger than the rest and slightly incurved.

As regards colour, the specimens preserved in spirit exhibit a light brownish hue, and have, moreover, a rather conspicuous dendritic pigmentary deposit on either side of the carapace behind the cervical sulcus.

Habitat.—Several specimens of this form, both males and females, were taken at the surface of the sea off Cape of Good Hope. The locality is given as follows:—

Station 141, December 17, 1873; lat. 34° 41′ S., long. 18° 36′ E.

The specimens examined by Kröyer were collected in the tropical part of the Atlantic, in lat. 14° N.; those examined by Professor Dohrn were derived from the Museum at Kiel, and stated to have been procured during the cruise of the Danish frigate "Galathea" —the locality was not recorded.

50. *Anchialus angustus*, G. O. Sars (Pl. XXXV. figs. 1–18).

Anchialus angustus, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 48.

Specific Characters.—Form of body slender and elongate. Carapace narrow, evenly emarginate posteriorly and not covering the trunk completely. Frontal margin jutting out in the middle as an acute triangular projection, and forming on either side between eye and base of antennæ a similar triangular lobe; antero-lateral corners rather broad and projecting, acuminate at tip. Tail slightly tapering, anterior segment in female with distinctly projecting epimera, last segment rather elongate. Eyes narrow, well-nigh cylindrical, cornea scarcely expanded. Antennular peduncle more slender than in preceding species. Antennal scale of a similar appearance to the one in that species, but having the denticle of the outer corner distinctly developed. Gnathopoda less robust. Legs having terminal part very slender and subdivided into seven articulations. The two posterior pairs of caudal limbs in female imperfectly developed; outer branch of fourth pair in male greatly produced, styliform. Telson very similar to that in *Anchialus typicus*, but somewhat narrower. Inner plate of uropoda having auditory apparatus well developed, outer plate about the same length, with only two spines, placed close together in the middle of outer edge, terminal section linguiform. Marginal setæ on both plates well developed. Length, 10 mm.

Remarks.—This is a very distinct species, and at once distinguished from the preceding by its slender form and comparatively small and narrow carapace. It also exhibits several differences in its anatomical details, though evidently belonging to the same genus.

Description.—Of this form three specimens were found in the collection, two adult

females (one of which has been mounted on a glass slide) and a broken male specimen, which I thought it right to dissect for anatomical purposes. The length of the adult female is 10 mm., that of the male about the same.

The form of the body (see Pl. XXXV. figs. 1, 2) is much more slender and elongate than in the typical species, and somewhat resembling that generally met with in the species of *Mysis*; the anterior division being very slightly dilated and about half as long as the posterior.

The integuments exhibit a peculiar, and, as it were, squamous sculpturing, most conspicuous on the ocular pedicles and the basal parts of the several limbs.

The carapace is comparatively small and narrow, contrary to what is found in the typical species, not nearly covering the whole surface of the trunk, two segments of which are exposed behind. It has, moreover, the posterior edge evenly emarginate in the middle, and tapers anteriorly in such manner that its most anterior part does not exceed in breadth the first caudal segment. The frontal margin juts out in the middle between the eyes as an acute triangular projection, and forms, moreover, on either side, a similar triangular lobe, projecting between each of the eyes and the base of the antennæ. The antero-lateral corners (see fig. 3) are rather broad and acuminate at the tip, and the inferior margins of the carapace form at the side of the oral parts a very conspicuous sinus.

The tail is rather slender, cylindrical, though slightly tapering posteriorly. The first segment exhibits in the female, as in the preceding species, on either side, a narrow elliptical vaulted plate or epimeron, and the last segment is rather elongate, about as long as the two preceding segments taken together.

The eyes are much narrower than in the preceding species, almost cylindrical, with the cornea scarcely at all expanded, and not fully occupying the outer half of the eye. The ocular pigment is of the usual dark hue.

The antennular peduncle (fig. 4) is less robust, with the second joint quite of a normal form, the last regularly cylindrical, scarcely at all dilated at the end. The outer flagellum has a similar lamellar expansion at its base to that of the typical species, and the male appendage would also seem to be quite similar.

The antennal scale (see fig. 5) exhibits an appearance very nearly agreeing with that in *Anchialus typicus*, but is a trifle larger, having the denticle of the outer corner distinctly developed, as also the marginal setæ much coarser. A suture is seen to run across the scale in close proximity to the inner corner, marking off an obtusely triangular terminal articulation, to which seven of the marginal setæ are affixed. The proximal part of the flagellum projects, as in the preceding species, considerably beyond the scale, but has the terminal joint comparatively larger than in that form, and the basal spine would seem to be somewhat smaller and quite smooth.

The oral parts, though developed upon the same type as in the preceding species, still exhibit in their structural details well-marked specific differences.

Thus, the spine issuing anteriorly from the anterior lip (fig. 6) is relatively much shorter, and the terminal lobes of the posterior lip (fig. 7) are obtusely truncate in front.

The mandibles (fig. 8) are chiefly distinguished from those in the typical species by the terminal joint of the palp being more elongate and narrow.

On the first pair of maxillæ (fig. 9) the outer lobe is more regularly curved, and the rudimentary exognath somewhat shorter. On the second pair (fig. 10) the terminal joint of the palp slightly differs in form, being comparatively shorter and broad in the middle, and having, moreover, a dense fringe of delicate cilia along the outer edge.

The maxillipeds (fig. 11) are comparatively less robust, and have at the inner corner of the basal part a distinct, densely setiferous masticatory lobe. The last joint of the endopodite is triangular, and its apical spine shorter than in *Anchialus typicus*. The epipodite, on the other hand, would seem to be comparatively larger.

The gnathopoda (fig. 12) are also much more slender than in the preceding species, and agree more in structure with those in other Mysidans.

The legs (fig. 13) are densely setose, especially along their inner edge, the setæ exhibiting a conspicuous fascicular arrangement. The terminal part is rather produced and very narrow, exceeding in length the preceding (carpal) joint, and is, moreover, subdivided into a rather great number of short articulations, no less than seven being counted on the middle pairs. The first pair of legs in the male do not seem in this form to exhibit any difference from those in the female.

Of the caudal limbs in the female, the three anterior pairs are developed in the usual manner, whereas the two posterior are represented merely by laminar expansions of the sternal parts of the segments, as is in the preceding species the case with all saving the first pair.

In the male, all the caudal limbs are natatory, but differ from those in the male of *Anchialus typicus* by the basal expansion of the inner branch being far less developed (see figs. 14, 15). Moreover, the outer branch of the fourth pair (fig. 16) is greatly produced, styliform, and composed of eleven articulations, the six outer of which are armed with spines instead of natatory setæ. Of the articulations of this branch the antepenultimate is much produced, and bears at the end, exteriorly, a rather elongate spine; the two succeeding articulations, on the other hand, are very small, and the last of them has two short apical spines.

The telson (fig. 17) exhibits an appearance very similar to that in the typical species, being, however, somewhat narrower and slightly tapering toward the apex, with twenty to thirty lateral denticles on either side. The apical incision occupies about one-sixth of the length of the telson, and has a form perfectly similar to that in *Anchialus typicus*. The terminal lobes bear a rather elongate apical spine, and are densely fringed along their inner edge with rather strong spinules.

The uropoda (fig. 18) have both plates of nearly equal length, and, contrary to what is the case in the typical species, are fringed with rather elongate plumose setæ. The inner plate has, moreover, the inner edge, beneath the marginal setæ, armed with numerous unequal spines, some of which—disposed at regular intervals—are rather long. The auditory apparatus within the base of this plate is much more fully developed than in *Anchialus typicus*, the otolith being rather large and of a rounded oval form. The outer plate is armed with only two spines issuing from a ledge-like projection at about the middle of the exterior edge, and has the outer part linguiform and setose all round.

Habitat.—The three above-mentioned specimens were all collected in the same locality, at the entrance of Port Philip, South Australia. The locality is given below as follows:—

Station 161, April 1, 1874; lat. 38° 22′ S., long. 144° 36′ E.; depth, 33 fathoms; sand.

51. *Anchialus pusillus*, G. O. Sars (Pl. XXXV. figs. 19, 20).

Promysis (?) pusilla, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 54.

Specific Characters.—Form of body rather short, with anterior division considerably dilated, tail very narrow. Carapace completely covering the trunk, slightly emarginate posteriorly; frontal margin forming in the middle an obtuse angle, antero-lateral corners obtusely rounded. Last caudal segment remarkably elongate. Eyes slightly expanded at apex with dark pigment. Antennular peduncle rather stout, outer flagellum very elongate. Antennal scale less rudimentary than in the other species, denticle of outer corner well defined. Legs slender, with terminal part short, triarticulate. Caudal limbs in female very small, almost obsolete. Telson elongate, scarcely shorter than uropods. Length, 3 mm.

Remarks.—I have recorded this form in my Preliminary Notices as a species of the genus *Promysis*, Dana. On closer examination I have, however, found this to be incorrect, and now believe that it should more properly be referred to the genus *Anchialus*, exhibiting, as it does, several characters in common with the latter genus, not to be met with in the former. My examination of the species has not been so close as could be wished, since both the specimens in the collection were mounted in Canada balsam on a glass slide, and in such a position as not to admit of examining all the parts satisfactorily.

Description.—Both the specimens in the collection are females, with greatly developed marsupial pouches, and thus may be assumed to have attained their full size. Notwithstanding this, their length does not exceed 3 mm., and this form may accordingly be regarded as a true dwarf Mysidan.

The form of the body (see Pl. XXXV. fig. 19) is comparatively short, with the anterior division considerably dilated, whereas the tail is exceedingly narrow.

The carapace is rather large, completely covering the trunk, no segments of which appear exposed. It is very slightly emarginate posteriorly and has rather a deep cervical sulcus, marking off its anterior part. The frontal margin is evenly arched at the sides, and forms in the middle a slight angular projection. The antero-lateral corners are but slightly produced and obtusely rounded.

The caudal segments are somewhat depressed and of uniform breadth, being much narrower than the anterior part of the carapace. The last segment is remarkably elongate, almost as long as the three preceding ones taken together.

The eyes are claviform, with the cornea somewhat expanded, and exhibiting a dark coloured pigment.

The antennular peduncle is comparatively very powerfully developed, about half as long as the carapace, and has the last joint distinctly the largest. Of the flagella, the outer one is remarkably elongate, almost equalling the whole body in length.

The antennal scale (see fig. 20) would seem to be constructed upon the same type as in the two preceding species, being rather short as compared with that in most other Mysidans, though not quite so rudimentary as in the other species of the genus, reaching, as it does, to about the middle of the antennular peduncle. The apex is somewhat obliquely truncate, with the denticle of the outer corner well defined. The basal part of the flagellum projects beyond the tip of the scale, as in the two preceding species, and has the middle joint by far the largest.

The legs appear to be rather slender, but have the terminal part comparatively short, and composed of only three articulations.

The marsupial pouch was greatly developed in both specimens, forming a very large, almost semiglobular prominence issuing from beneath the posterior part of the trunk.

The caudal limbs would seem to be exceedingly small, well nigh obsolete.

The telson is rather elongate and narrow, but its form could not be exactly made out in the specimens examined.

The uropoda have both plates about equal, and fringed with long setae. The auditory apparatus within the base of the inner plate is distinctly developed.

Habitat.—The two specimens in the collection were taken in the Celebes Sea, October 22, 1874; lat. 5° 44′ N., long. 123° 34′ E.; at Station 199, most probably at the surface of the sea.

Genus 6. *Mysidopsis*, G. O. Sars, 1864.

Mysidopsis, G. O. Sars, Beretning om en i Sommeren 1863 foretagen zoologisk Reise, Nyt Magazin f. Naturvid., 1864.

Generic Characters.—Carapace comparatively small, not completely covering the trunk; frontal margin more or less produced in the middle. Eyes well developed,

pyriform. Antennular peduncle of usual form; male appendage rather large. Antennal scale lanceolate, setose on both edges, with a short apical articulation. Mandibles without any distinct molar protuberance. First pair of maxillæ with inner lobe very small; second pair wanting the inner setiferous expansion of the basal part; terminal joint of palp oblong, not incurved; exognath very narrow. Maxillipeds and gnathopoda powerfully developed. Legs subequal, comparatively short and stout, with the joints partly appressed, propodal joint subdivided into three articulations, terminal joint having a slender, setiform claw. Marsupial pouch composed of three pairs of incubatory lamellæ, anterior pair very small. Male sexual appendages short and thick. Caudal limbs in male all natatory. Telson comparatively short, subtriangular, apex entire, or cleft. Uropoda with inner plate much shorter than outer; auditory apparatus well developed.

Remarks.—This genus, established by the author as early as 1864, is chiefly characterised by the form of the antennal scale, the structure of the mandibles and of the maxillæ, the comparatively robust form of the legs, finally by the form of the telson. From the genus *Mysis*, to which it has some resemblance in its general aspect, it is easily distinguished by the caudal limbs in the male being all natatory. To the genus *Promysis* of Dana it would seem to be nearly allied, if not actually the same. But, as Dana says that the terminal part ("tarsus") of the legs in *Promysis* is not subdivided, whereas in all species of the genus *Mysidopsis* it is distinctly triarticulate, I have not felt warranted in identifying the two genera. Moreover, the species of the genus *Promysis* are pelagic, whereas those of *Mysidopsis* are true bottom forms.

Three northern species, viz., *Mysidopsis didelphys*, Norman, *Mysidopsis gibbosa*, G. O. Sars, and *Mysidopsis angusta*, G. O. Sars, have hitherto been recorded, and on the Challenger Expedition a fourth species, apparently belonging to the present genus, has been procured and will be described below.

52. *Mysidopsis incisa*, G. O. Sars (Pl. XXXV. figs. 21–23).

Mysidopsis (?) *incisa*, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 49.

Specific Characters.—Form of body rather slender. Carapace small, exposing the two posterior segments of trunk, frontal margin but slightly projecting in the middle. Last caudal segment longer than preceding. Eyes large, cornea much expanded and deeply emarginate above. Antennal scale narrowly lanceolate. Legs comparatively feeble, with the joints only slightly expanded. Telson shorter than last segment, lateral edges denticulate throughout, apex deeply cleft, incision occupying about one-fourth of the length of the telson and bordered with delicate spinules; terminal lobes pointed, with apical spines not stronger than lateral denticles. Length, 8 mm.

Remarks.—I have felt warranted in referring this form to the genus *Mysidopsis*.

since in most respects it would seem to agree pretty well with that genus. The telson, it is true, has the apex not entire as in the typical species, *Mysidopsis didelphys;* but there is another species, undoubtedly belonging to this genus, viz., *Mysidopsis angusta*, which likewise has the telson cleft at the tip, although the borders of the incision in that species are smooth, and not spinulose.

Description.—Of the present form only a single mutilated specimen, an adult female, was found in the collection. It has a length of about 8 mm.

The form of the body (see Pl. XXXV. fig. 21) is comparatively slender, about as in the northern form *Mysidopsis angusta*, but with the anterior division somewhat more dilated.

The carapace, as in the other species of this genus, is rather small, not nearly covering the whole of the trunk, the two posterior segments of which appear almost wholly exposed behind. Its anterior third is marked off by a well-defined cervical impression, and is slightly arched above. The frontal margin forms only a very slight angular projection in the middle, and the antero-lateral corners are obtusely rounded.

The caudal segments are all regular cylindrical, and the last of them somewhat longer than the rest.

The eyes are comparatively large and slightly flattened, with the cornea much expanded and deeply emarginate above. The ocular pigment is of the usual dark hue.

The antennular peduncle does not attain any considerable length, and exhibits the usual structure. Both of the flagella were broken near their bases.

The antennal scale (fig. 22) projects only beyond the antennular peduncle by about one-fourth of its length, and exhibits a narrow lanceolate form, with both margins setiferous throughout their whole length. The apical articulation is rather small, and bears four of the marginal setæ. The proximal part of the flagellum is much shorter than the scale, and has the middle joint largest. The terminal part was broken in the specimen examined.

Of the legs only one of the second pair remains in the specimen. Its structure would seem to agree perfectly well with that in the other species, except that the joints are somewhat less expanded.

The two posterior pairs of incubatory lamellæ composing the marsupial pouch are seen in the fig. 21; the anterior rudimentary pair would seem to have been thrown off along with the corresponding legs.

The caudal limbs do not exhibit any peculiarities in their structure.

The telson (see fig. 23) is somewhat shorter than the last caudal segment, and exhibits the usual triangular form, being broadest at the base and tapering rapidly toward the apex, with the lateral edges almost straight, and armed on either side with close upon sixteen small denticles, disposed throughout their whole length. The apex is not, as in

the typical species, entire, but deeply cleft in the middle, the incision being rather narrow, and occupying about one-fourth of the length of the telson. The terminal lobes are pointed and densely spinulose at their inner edge, and also furnished at the tip with a few denticles of the same appearance as those occurring along the lateral edges.

The uropoda (see fig. 23) had the terminal part of both plates broken off in the specimen examined, and their respective lengths cannot therefore be given. The auditory apparatus within the base of the inner plate is well developed, with the otolith rather large and globular.

Habitat.—The above described specimen was taken at the entrance of Port Philip, South Australia, along with the specimens of *Anchialus angustus*. The locality is:—

Station 161, April 1, 1874; lat. 38° 22′ S., long. 144° 36′ E.; depth, 33 fathoms: sand.

Genus 7. *Siriella*, Dana, 1852.

Siriella, Dana, United States Exploring Expedition, Crustacea, pt. i.
Cynthia, Thompson (male).

Generic Characters.—Form of body more or less slender. Carapace very small, not nearly covering the whole of the trunk; frontal margin produced in the middle. Eyes normally developed. Antennular peduncle rather elongate; male appendage but slightly prominent, issuing from lower face of terminal joint. Antennal scale with outer edge naked, and terminating in a small dentiform projection, apex obliquely truncate. Mandibles with molar protuberance imperfectly developed. Second pair of maxillæ having but two masticatory lobes; terminal joint of palp large and oblong, not incurved. Legs subequal, rather stout, with propodal joint entire or subdivided into two articulations only, and having a double row of densely crowded apical bristles; terminal joint forming a very strong falciform claw. Caudal limbs in male natatory, basal lobe of inner branch usually transformed into two gill-like, more or less spirally twisted stems. Telson elongate, densely spinose at the edges, apex entire, not incised. Outer plate of uropoda broader than inner, and having an imperfect articulation at apex, outer edge partly spinous. Auditory apparatus well developed.

Remarks.—The present genus is chiefly characterised by the structure of the legs, which are more decidedly unguiculate than in any other known genus of Mysidans, further by the caudal limbs in the male having the basal expansion of the inner branch converted into peculiar gill-like appendages, finally by the structure of the telson and the outer plate of the uropoda. The genus is represented in most tracts of the ocean, and comprises about ten different species, the greater part of which would seem to lead a true pelagic existence, being met with at the surface of the sea, far from the coasts. The

Challenger specimens belong to two different species, to be described in the sequel. They may easily be known by the following distinctive characters:—

Eyes very large. Antennal scale linear. Telson exceedingly narrow, truncate at tip, ...	*S. thompsoni* (M.-Edw.).
Eyes comparatively small. Antennal scale rhomboidal. Telson linguiform, with apex rounded, ...	*S. gracilis*, Dana.

53. *Siriella thompsoni* (M. Edwards) (Pl. XXXVI. figs. 1–24).

Cynthia sp., V. Thompson, Researches, p. 55, pl. vi.
Cynthia thompsoni, M.-Edwards, Histoire nat. des Crustacés, t. ii. p. 462, pl. .
Siriella vitrea, Dana, United States Exploring Expedition, Crustacea, pt. i. p. 656, pl. xliii. figs. 6, *a–m*.
? *Siriella brevipes*, Dana, United States Exploring Expedition, Crustacea, pt. i. p. 660, pl. xliv. figs. 3, *a-b*.
Cynthia inermis, Kröyer, Nat. Hist. Tidsskr., 2den Række, Bd. i. p. 44, Tab. ii. figs. 6, *a–g* (male).
? *Promysis galathea*, Kröyer, Nat. Hist. Tidsskr., 2den Række, Bd. i. p. 59, Tab. ii. figs. 8, *a k* (female).
Siriella edwardsii, Claus, Zeitschr. f. wiss. Zool., Bd. xviii. p. 271, pl. xviii.
Siriella thompsoni, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 50.

Specific Characters.—Form of body not very slender. Frontal projection acutely pointed. Last caudal segment shorter than the two preceding taken together. Eyes very large, with cornea greatly expanded. Antennal scale narrow, linear, apex somewhat obliquely truncate. Propodal joint of legs undivided, terminal claw of moderate length. Telson exceedingly narrow; apex truncate, with three small teeth between the innermost pair of apical spines. Outer plate of uropoda much shorter than inner, with close upon six spines on the outer edge. Length attaining 10 mm.

Remarks.—I cannot but assume, that all the forms described under the different names referred to above, belong to one and the same species, and that this is the one first described by V. Thompson as *Cynthia* sp., and afterwards more fully designated by Milne-Edwards as *Cynthia thompsoni*. As the generic name *Cynthia* has been long since applied to a form of Ascidians, that proposed by Dana must of course be retained for the genus. Originally, the name *Cynthia* was only applied to the males, and *Siriella* to the females, the sexual differences being unknown till fully elucidated by Professor Claus.

Description.—The length of the largest example collected is about 10 mm., but most of the specimens in the collection are much inferior in size, though some of them are apparently adult.

The form of the body (see Pl. XXXVI. figs. 1–3) is comparatively less slender than in most of the other species, though not nearly so thickset, as represented in the figure given by Dana of his *Siriella vitrea*, which form in my opinion is identical with the present species.

The carapace is very small, not covering by far the whole of the trunk, two segments of which, and even a small part of a third, being exposed behind. It is evenly emarginate posteriorly in the middle, and tapers a little anteriorly, hence not being broader in its

anterior part than is the first caudal segment. The cervical impression is well marked, though not particularly deep. The frontal margin juts forth in the middle between the eyes as a narrow triangular lappet, sharply pointed at the tip, but not very prominent. The antero-lateral corners of the carapace are obtuse-angled, and but slightly produced.

The caudal segments are simple cylindrical and taper very slightly posteriorly, the anterior five about equal in length, whereas the last segment is somewhat more elongate.

The eyes are very large, pyriform, with the cornea considerably expanded, and occupying the greater part of the eye. The ocular pigment is of a dark black colour.

The antennular peduncle is rather slender, almost half as long as the carapace, and has the last joint in the female simple cylindrical, in the male (see fig. 4) slightly dilated, and about as long as the basal. The male appendage is rather large, but only slightly projecting in front of the peduncle, connate, as it is, with the lower face of the terminal joint to its very base (see fig. 5). On removing the numerous fine hairs, with which this appendage is clothed, the latter are found to originate from a narrow band doubled upon itself along the whole lower face of the appendage (fig. 5). Of the flagella, the outer is much more elongate than the inner, and provided along its proximal part with a row of delicate curved sensory bristles.

The antennal scale (fig. 6) does not quite reach the tip of the antennular peduncle, and exhibits a very narrow, linear form, about five times as long as broad. The outer edge is perfectly straight and naked, terminating with a small dentiform projection. The apex is somewhat obliquely truncate, with the inner corner slightly projecting. The flagellum does not attain the length of the outer antennular flagellum, and has the proximal part, or peduncle, shorter than the scale and very slender, with the middle joint by far the largest, and the last exceedingly small.

The anterior lip (see fig. 7) is produced anteriorly as a spiniform projection, similar to that occurring in the genus *Anchialus*.

The posterior lip does not exhibit any peculiarities in its structure.

The mandibles (see fig. 7) are of moderate size, with the armature of their cutting edges (fig. 9) perfectly agreeing with that in the other species of the genus, and rather differing from that in most other Mysidans. Thus, the molar protuberance forms merely a simple conical process, without any trace of the usual fluted surface. The palp (see fig. 7) has the middle joint considerably expanded and laminar, whereas the last joint (fig. 8) is comparatively narrow, with a dense row of ciliated bristles along the posterior half of the inner edge.

The first pair of maxillæ (fig. 10) exhibit quite a normal structure.

The second pair of maxillæ (fig. 11), on the other hand, are highly distinguished by the absolute want of the posterior masticatory lobe, only two such lobes being found. The palp is very fully developed, with the terminal joint rather large, oblong, and not incurved. The exognath is comparatively small and elliptical in form.

The maxillipeds (fig. 12) are more pediform than in most other Mysidans, the basal section being comparatively short, whereas the terminal part, or endopodite, is rather produced. The epipodite is comparatively small, and exhibits the usual lanceolate form and membranous structure.

The gnathopoda (fig. 13) are still more pediform, but rather smaller than the true legs, from which they moreover differ in the terminal joint being not unguiform but lamellar, and armed with numerous slender spines.

The true legs (figs. 14, 16) are comparatively less feeble in structure than in most other Mysidans, and more decidedly ambulatory in their character, the propodal joint being not multiarticulate and flexible, but quite rigid, and in the present species apparently undivided, whereas in the other species a short proximal articulation may be distinguished. From the tip of the propodal joint a double row of densely crowded and very delicate, finely serrate bristles are seen to spring, forming a dense fascicle, between which the terminal joint projects (see fig. 15). The latter has the form of a strong falciform claw, resembling that in the higher forms of Macrurans. The posterior pair of legs (fig. 16) are somewhat smaller and more slender than the rest, especially in the male, but do not differ in structure. In all the legs, and likewise in the maxillipeds and gnathopoda, the exopods are powerfully developed, with the basal part expanded and muscular, the terminal part consisting of about ten short setiferous articulations.

The marsupial pouch in the female is, as in the other species of the genus, composed of three pairs of incubatory lamellæ, of which, however, the anterior pair are very small.

The sexual appendages of the male (fig. 17) are comparatively small, and anteriorly have three strong ciliate setæ, the tip, moreover, being provided with a transverse row of short curved bristles.

The caudal limbs in the female (fig. 2) exhibit the rudimentary structure characteristic of the family. In the male (fig. 1), however, they are all strongly developed and natatory, with a broad muscular part, and multiarticulate setiferous branches, being moreover highly distinguished by the peculiar gill-like appendage originating at the base of the inner branch. This appendage, which undoubtedly corresponds to the simple lamellar expansion met with here in other male Mysidans, is divided into two cylindrical stems of a quite gill-like structure, and in the middle pairs (see figs. 19, 21) these stems are coiled up spirally, whereas in the first (figs. 18, 20) and last pair they are well-nigh straight. In the first pair, as usual, the terminal part of the inner branch is wholly wanting, this branch being exclusively represented by the above-mentioned appendage (see fig. 18). The fourth pair, which in male Mysidans generally exhibit some modification of the outer branch, would not seem to differ in any respect from the preceding pair.

The telson (fig. 22) is about as long as the two preceding segments taken together, and remarkably narrow, being considerably constricted in front of the middle, with the outer part almost linear and distinctly channelled along the dorsal face. The lateral

edges are armed in their outer part with numerous small denticles, and have moreover, near the base, on either side, three somewhat coarser denticles placed at some distance from the rest. The apex (fig. 23) is abruptly truncate, and bears six rather strong spines, the innermost pair the largest, and, between the latter, three very small denticles occur, besides two rather long and delicate setæ (omitted in the figure).

The uropoda (fig. 24) are rather large, projecting considerably beyond the telson. The inner plate is narrow lanceolate, with the auditory apparatus very fully developed, and the inner edge, beneath the marginal setæ, densely spinose. The outer plate is appreciably shorter than the inner, but rather broader, with the exterior edge armed, in front of the terminal linguiform articulation, with about six spines, increasing in size posteriorly.

As regards colour, the animal, according to Dana, is in a living state almost colourless, though sometimes purply along the ventral face of the tail, and tinged with red at the sides of the anterior division (the marsupial pouch). This purplish and reddish colour is found to arise from stellate pigmentary deposits distributed with great regularity and still retained in the specimens preserved in spirit. Thus, along the ventral face of the tail is seen (figs. 1, 2, 3) on each segment a median and two lateral pigment-spots, the one occurring at the end of the last segment being considerably ramified. On the two posterior exposed segments of the trunk, similar pigment-spots may be seen, and on either side of the marsupial pouch in the female (fig. 2), an exceedingly ramified reddish pigmentary deposit may with facility be discerned. Moreover, at the inner side of the antennular peduncle, similar pigmentary ramifications occur, extending to a greater or less distance even into the inner flagellum.

Habitat.—All the specimens in the collection were taken at the surface of the sea. The following is a list of the localities, with dates appended :—

Date.	Locality.
?	Between Tenerife and St. Thomas.
June 18 to 19, 1873.	North Atlantic.
October 5, 1873.	South Atlantic.
June 17, 1874.	Australian Seas, Sydney to Wellington.
April 3, 1875.	North Pacific.
July 23, 1875.	North Pacific.
August to September 1875.	Pacific Ocean.
October 18, 1875.	South Pacific.
October 19, 1875.	South Pacific.
October 22, 1875.	South Pacific.
November 17, 1875.	South Pacific, off coast of Chili.
March 3 to 5, 1876.	South Atlantic.
March 14, 1876.	South Atlantic.
April 26, 1876.	North Atlantic, off Cape Verde.
April 29, 1876.	North Atlantic.

The specimen examined by V. Thompson, and also those described by Milne-Edwards and Kröyer, were from the Atlantic. Dana collected the species (=*Siriella vitrea* and *Siriella brevipes*) in the Pacific. The specimens examined by Professor Claus were derived from the Museum in Hamburg; locality not recorded.

Distribution.—According to the localities stated above, the present species would seem to have a very extensive geographical distribution, ranging, as it does, throughout the North and South Atlantic, the Australian Seas, and the Pacific Ocean.

54. *Siriella gracilis*, Dana (Pl. XXXVI. figs. 25–28).

Siriella gracilis, Dana, United States Exploring Expedition, Crustacea, i. p. 658, pl. xliv. figs. 1, *a–g*.

Siriella gracilis, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 51.

Specific Characters.—Form of body somewhat more slender than in *Siriella thompsoni*. Frontal plate triangular, less acute. Last caudal segment as long as the two preceding taken together. Eyes much smaller than in preceding species, cornea scarcely expanded at all, and occupying but a small part of the eye. Antennal scale rhomboidal, apex very obliquely truncate, inner corner projecting. Propodal joint of legs distinctly subdivided into two articulations, terminal claw very elongate. Telson linguiform, apex evenly rounded, with a small tridentate plate issuing between the last pair of elongate spines. Uropoda with outer plate but slightly shorter than inner, and having a smaller number of spines at the exterior edge. Length about 6 mm.

Remarks.—The present species may be easily distinguished from the preceding by a somewhat more slender form of body, the less developed eyes, and the deviating form of the antennal scale and of the telson.

Description.—The length of the largest specimen in the collection does not exceed 6 mm., and this species is hence of rather smaller size than the preceding.

The form of the body (see Pl. XXXVI. fig. 25) appears somewhat more slender than in *Siriella thompsoni*, though not nearly to such a degree as in certain other species of the genus.

The carapace exhibits a form very similar to that in *Siriella thompsoni*, but has the frontal projection somewhat less pointed and triangular in form.

Of the caudal segments, the last is rather elongate, about as long as the two preceding segments taken together.

The eyes are far from so fully developed as in *Siriella thompsoni*, being but very slightly expanded at the end, with the cornea occupying a comparatively small part of the eye.

The antennular peduncle would seem to have the last joint relatively shorter than in the preceding species, but for the rest it exhibits a very similar structure.

The antennal scale (fig. 26), on the other hand, is very different, being comparatively

shorter and broader, only three times as long as broad, and of a somewhat rhomboidal form, the apex being very obliquely truncate, with the inner corner strongly projecting, and the denticle of the outer farther removed from the apex than is the case in *Sirella thompsoni*.

The legs are somewhat more robust, and have the propodal joint distinctly subdivided into two articulations, the proximal being the shorter. The terminal claw, moreover, is comparatively much more elongate.

The telson (see fig. 27) is somewhat less slender than in the preceding species, and has a decidedly linguiform shape, the apex being evenly rounded, not truncate. The lateral edges are coarsely denticulate along their outer part, and the posterior pair of denticles, issuing from the apex, are considerably longer than the rest. Between the latter projects (see fig. 28) a small tridentate plate bearing two delicate diverging bristles.

The uropoda (see fig. 27) have the inner plate but very slightly longer than the outer, and the auditory apparatus well developed. The outer plate has a smaller number of spines at the exterior edge than in *Sirella thompsoni*, not more than two or three being frequently found.

The arrangement of the pigmentary spots on the body is very similar to that in the preceding species. But in this form occurs in addition a richly arborescent pigmentary deposit on the basal part of the telson, as also on the ocular pedicles.

Habitat.—Of this species, too, all the specimens in the collection were taken at the surface of the sea, but somewhat sparingly, not more than one or two specimens being taken as a rule in each place. The following is a list of the localities, with dates appended:—

Date.	Locality.
September 13, 1874.	Arafura Sea.
February 5, 1875.	Off Samboangan, Mindanao, Philippine Islands.
February 1875.	North of New Guinea.
April 3, 1875.	North Pacific.
August 24, 1875.	Tropical Pacific.
August to September 1875.	Tropical Pacific.

The specimens examined by Dana were collected in the Pacific at three different localities.

Distribution.—To judge from the above stated localities, the distribution of the present species would seem to be more restricted than is that of the preceding form, it being exclusively met with in the Pacific Ocean and the seas of the Indian Archipelago.

Genus 8. *Euchætomera*, G. O. Sars, 1883.

Euchætomera, G. O. Sars, Preliminary Notices on the Challenger Schizopoda.

Generic Characters.—Carapace not fully covering trunk, emarginate posteriorly; frontal margin slightly projecting in the middle. Eyes somewhat irregular in form, cornea contracted in the middle. Antennular peduncle of moderate size; male appendage normally developed. Antennal scale with outer edge naked and terminating in a dentiform projection, apex obliquely truncate, with inner corner projecting. Legs very slender, increasing in length posteriorly, and provided with unusually strong plumose setæ, propodal joint subdivided into three distinctly defined and mobile articulations, terminal joint unguiform, exopods with terminal part very elongate and flexible. Caudal limbs in female simple but rather large, laterally extended and fringed with remarkably strong setæ; those of male all natatory. Telson remarkably short, lamelliform, rounded, apex entire and provided with two long ciliated setæ. Uropoda with elongate and narrow plates, fringed all round with long setæ, inner plate much shorter than outer, and with auditory apparatus well developed.

Remarks.—The present new genus is chiefly characterised by the unusually short, lamelliform telson, agreeing somewhat in form with that of the genus *Erythrops*, G. O. Sars; also by the slender legs and the very strong development of the setæ on the several limbs. The species of this genus would seem to lead a pelagic existence as is the case with those of the preceding genus, met with, as they are, at the surface of the sea far from the coasts. Two species are represented in the collection, easily distinguished by the armature of the telson, as follows:—

Telson { with lateral edges denticulate, ... *E. typica*, G. O. Sars.
{ without lateral denticles, ... *E. tenuis*, G. O. Sars.

55. *Euchætomera typica*, G. O. Sars (Pl. XXXVII. figs. 1–20).

Euchætomera typica, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 52.

Specific Characters.—Form of body rather robust. Carapace broadly emarginate posteriorly, exposing almost wholly the two last segments of the trunk; frontal projection acutely pointed. Last caudal segment comparatively short. Eyes of moderate size, pyriform, projecting on either side, and separated at the base by a distinct interval. Antennal scale oblong, somewhat curved, about four times as long as broad, spine of outer corner remarkably strong. Telson fully as broad as long, with five strong lateral denticles on either side. Length, 14 mm.

Remarks.—The examination of this and the following form, as regards external appearance, has been somewhat difficult, from the specimens being mounted on glas-

slides in shallow cells, whereby the body has been partially crushed and deformed. The anatomical details have, however, been satisfactorily made out from the dissection of one of the specimens.

Description.—The length of the adult female is about 14 mm., that of the male nearly the same.

The form of the body (see Pl. XXXVII. fig. 1) would appear to be rather short and robust, with the tail relatively less elongate than usual, in proportion to the anterior division.

The carapace does not nearly cover the whole of the trunk, the two posterior segments of which are well nigh entirely exposed. It is evenly emarginate posteriorly, and exhibits in its anterior part a distinct, though not particularly deep, cervical impression. The frontal margin juts out in the middle as a narrow acuminate lappet, projecting between the bases of the eyes and reaching to about the middle of the basal joint of the antennulæ.

The tail does not exceed in length the anterior division of the body, and has the segments rather thick in proportion to their length. The last segment only slightly exceeds the preceding in length.

The eyes—separated at the base by a distinct interval—are of moderate size, and extend to each side so as to project considerably laterally. They are pyriform in shape, about as long as broad, with the cornea rather expanded, and exhibiting in the middle a similar constriction to that seen in the species of the Euphausiidan genera, *Thysanoëssa*, *Nematoscelis*, and *Stylocheiron*.

The antennular peduncle (fig. 2) presents quite a normal appearance, being somewhat dilated towards the apex, with the last joint about as long as the basal, and having three strong ciliated setæ springing from the inner edge. In the male, a hairy lobe projects, as usual, from the end of the peduncle beneath the insertion of the flagella. The latter were both broken off near their base in the specimens examined.

The antennal scale (fig. 3) only slightly exceeds in length the antennular peduncle, and exhibits an oblong-linear form, about four times as long as broad. It is somewhat curved outwards, and has the exterior edge naked and slightly concave, jutting out at the end as a very strong dentiform projection. The apex is obliquely truncate, having the inner corner projecting and fringed, together with the whole inner edge, with about seventeen unusually strong and densely ciliate setæ. The proximal part of the flagellum does not attain the length of the scales, and has the middle joint longest, with three plumose setæ at the end interiorly.

The anterior lip (fig. 4) exhibits the usual somewhat galeate form, with an obtusely rounded prominence anteriorly.

The posterior lip (fig. 5) has the terminal lobes obliquely rounded and densely ciliate, with a slight angle exteriorly.

The mandibles (fig. 6) are powerfully developed, with the masticatory part considerably expanded, and the cutting edges (fig. 7) exhibiting an armature similar to that observed in most other Mysidans. The palp (see fig. 6) is longer than the mandible itself, and has the middle joint largest, with a row of strong plumose setæ along its outer edge. Its terminal joint is lamelliform, and, besides a number of elongate setæ, furnished near the tip with a row of small spinules.

The first pair of maxillæ (fig. 8) exhibit quite a normal appearance.

The second pair of maxillæ (fig. 9) have the terminal joint of the palp rather large and sharply incurved, oval in form, and furnished along the outer edge with seven exceedingly elongate setæ, the outer part of which is somewhat curved and quite naked, whereas their proximal part is coarsely ciliate. The exognath is comparatively small and triangular in form, with about nine marginal setæ.

The maxillipeds (fig. 10) are rather strong, with the basal part jutting out at the end interiorly as a small linguiform masticatory lobe. The joints of the endopodite are comparatively broad and appressed, the last triangular, with a strong apical spine. The exopodite is much longer than the endopodite, but very slender, with the basal part rather narrow and the terminal part composed of ten articulations. The epipodite, finally, is unusually small and oval in form, with four bristles springing from its upper face.

The gnathopoda (fig. 11) are, as usual, more pediform in character, though differing considerably in appearance from the true legs. The endopod is rather elongate, with the carpal and propodal joints largest and nearly equal in length, as also very movably jointed together. The terminal joint is very small and densely hirsute; it is sharply incurved and exceedingly mobile, admitting of being bent in against the preceding joint.

The legs (fig. 12) are very slender and elongate, increasing somewhat in length posteriorly, and are furnished, too, with unusually strong plumose setæ. The terminal part is somewhat longer than the preceding (carpal) joint, and subdivided into three distinctly defined and mobile articulations, besides the apical claw (fig. 13), which is well developed, though not particularly strong. Of the propodal articulations, the first is by far the largest, in the anterior pair (fig. 12) about as long as the other two taken together, in the posterior pair (fig. 14) still longer and much narrower.

The marsupial pouch in the female would seem to agree in structure with that of *Mysis*.

The caudal limbs in the female (figs. 15, 16) constitute, as usual, simple, non-articulate narrow plates, but are somewhat larger and more projected laterally than in most other Mysidans. Moreover, their marginal setæ are remarkably strong, and exhibit a very peculiar ciliation, the cilia being disposed in dense verticils at regular intervals (see fig. 17). In the male all the limbs are natatory, with multiarticulate setiferous branches. In the first pair (fig. 18) the inner branch is, as usual, rudimentary and non-articulate, and would seem to lack the basal expansion.

The telson (fig. 20) exhibits an aspect most characteristic of the genus and quite different from that usually met with in the Mysidæ, save in the genus *Erythrops*, G. O. Sars. It is very short, lamelliform, fully as broad at the base as it is long, having the lateral edges armed on either side with five strong denticles, and the apex narrowly truncate, bearing in the middle two very long and densely ciliate setæ.

The uropoda (fig. 19) have the terminal plates very slender and fringed all round with strong plumose setæ. The inner plate is much the shorter and lanceolate in form, with the base considerably dilated and containing a fully developed auditory apparatus, the otolith being rather large and of globular form. The outer plate is about one-fifth longer than the inner, and very narrow, linear, though somewhat curved outwards and truncate at the tip.

As to colour, the specimens preserved in glycerine were of a uniform light brownish hue, without any trace of the stellate pigmentary spots found in the species of the preceding genus.

Habitat.—Of this form only three specimens were found in the collection, taken at the surface of the sea in the North Pacific. The following is a list of the localities, with dates appended:—

Date.	Locality.
June 28, 1875.	Station 244; lat. 35° 22′ N., long. 169° 53′ E.
July 2, 1875.	Station 246; lat. 36° 10′ N., long. 178° 0′ E.
July 12, 1875.	Station 252; lat. 37° 52′ N., long. 160° 17′ W.

Quite recently I have had an opportunity, through the kindness of Mr. Hoyle, of examining another specimen, a young female, of apparently the same species, taken April 9, 1876, in the Atlantic. The specimen was mounted on a glass slide together with a small Cephalopod and several other surface animals.

56. *Euchætomera tenuis*, G. O. Sars (Pl. XXXVII. figs. 21–24).

Euchætomera tenuis, G. O. Sars, Preliminary Notices on the Challenger Schizopoda, No. 53.

Specific Characters.—Form of body more slender than in preceding species, tail especially much narrower, with last segment greatly elongate. Carapace comparatively large, posterior emargination rather narrow, rostral projection very slight. Eyes greatly expanded, broader than long, and close together. Antennal scale very narrow, six times as long as broad, denticle of outer corner small. Legs exceedingly slender, with scattered but rather long bristles. Telson having lateral edges perfectly smooth, apex with a slight dentiform projection on either side. Length, 8 mm.

Remarks.—The present species may be easily known from the preceding by its exceedingly narrow tail, the last segment of which is greatly elongate, by the short and thick eyes, the narrow antennal scale, and the want of lateral denticles on the telson.

Description.—Only a single specimen, apparently a young female, was procured during the Expedition. It has a length of 8 mm.

The form of the body (see Pl. XXXVII. fig. 21), somewhat deformed in the specimen by pressure, would appear to be much more slender than in *Euchatomera typica*, and the tail in particular is remarkably narrow, as compared with the anterior division.

The carapace would seem to be relatively larger than in the preceding species, its wings partly advancing over the first caudal segment. It exhibits, however, posteriorly in the middle, a deep but narrow emargination, exposing the dorsal part of the two posterior segments of the trunk. The frontal margin presents in the middle a very slight projection, scarcely reaching beyond the ocular segment.

The caudal segments are cylindrical, and the four anterior very short and subequal, the fifth a trifle longer, and the last exceedingly elongate, nearly as long as the preceding three taken together.

The eyes are greatly expanded toward the apex, being broader than long, and originate close together, so as not to project laterally. The cornea exhibits, somewhat anterior to the middle, a transverse constriction similar to that in the preceding species.

The antennular peduncle appears somewhat more slender than in *Euchatomera typica*, but otherwise exhibits a very similar structure.

The antennal scale (fig. 22) is very narrow, linear, about six times as long as broad, and very slightly curved. As in the preceding species, the apex is obliquely truncate, with the inner corner somewhat projecting and the outer armed with a dentiform projection, but the latter is far from so strong as in that species.

The legs (fig. 23) are extremely slender, and the posterior pair reach, when reflexed, even beyond the last caudal segment (see fig. 21). In their structure they agree with those in the preceding species, saving that the marginal setæ are fewer in number and also rather more elongate.

The telson (fig. 24) exhibits a short lamelliform shape similar to that of *Euchatomera typica*, being but very little longer than broad, but differs materially in the lateral edges being perfectly smooth, without a trace of the strong denticles occurring in that species. The apex is narrowly truncate, with a very small dentiform projection on either side, and the terminal setæ placed close together.

The uropoda do not seem to differ essentially from those in *Euchatomera typica*, saving that their terminal plates are a trifle more slender.

Habitat.—The above described specimen was taken November 18, 1875, at the surface of the sea, in the South Pacific, off the coast of Chili.

Genus 9. *Heteromysis*, Smith, 1874.

Heteromysis, Smith, Report upon the Invertebrate Animals of Vineyard Sound and adjacent waters.
Chiromysis, G. O. Sars, Middelhavets Mysider.

Generic Characters.—Form of body comparatively short. Carapace emarginate posteriorly, not covering completely the trunk, frontal margin projecting in the middle. Eyes small. Antennal scale very minute, lamelliform, setose on both edges. First pair of true legs much stronger than the rest, with propodal joint entire and spinous at inner edge; terminal joint unguiform. Remaining legs feeble in structure, with terminal part multiarticulate and setous, terminal claw obsolete. Caudal limbs in both sexes of same structure, forming small, simple, non-articulate, setose plates. Telson comparatively short, deeply cleft at apex. Inner plate of uropoda shorter than outer.

Remarks.—This genus, first established by Professor Smith, is most prominently characterised by the peculiar and strong development of the first pair of true legs, as also by the caudal limbs in the male being of the same rudimentary appearance as in the female. Three species of this genus have hitherto been recorded, viz., *Heteromysis formosa*, Smith, from the eastern coast of North America, *Heteromysis microps*, G. O. Sars, from the Mediterranean, and *Heteromysis norvegica*, G. O. Sars, from the Norwegian coast. A fourth species, to be described below, was also taken on the Challenger Expedition. All the species are decidedly littoral in character, being never met with either in the open sea, or at any considerable depth.

37. *Heteromysis bermudensis*, n. sp. (Pl. XXXVIII. figs. 1–7).

Specific Characters.—Form of body exceedingly short and thickset. Carapace evenly arched above, frontal projection triangular. Last caudal segment not longer than preceding. Eyes ovoid, cornea occupying about a third part of the eye, ocular pigment dark. Antennal scale oblong-oval, about three times as long as broad. Telson triangular, lateral edges armed on either side in their outer part with about six denticles; apical incision occupying third part of length of telson, somewhat broad, only inner half bordered with spinules; terminal lobes narrow, with two unequal apical spines. Length, 6 mm.

Remarks.—This species would seem to be most nearly related to the Norwegian form, *Heteromysis norvegica*, G. O. Sars, from which, however, it may be readily distinguished by its much inferior size and more thickset form. It also exhibits great resemblance to *Heteromysis formosa*, Smith, but differs in the small size of the antennal scale and the somewhat deviating form and armature of the telson. From the Mediterranean form, *Heteromysis microps*, G. O. Sars, it is likewise distinguished by the form and armature of the telson, as also by its more fully developed eyes.

Description.—Only a solitary, somewhat mutilated specimen, an adult female, was procured on the Expedition. It measures only 6 mm. in length.

The form of the body (see Pl. XXXVIII. figs. 1, 2) is remarkably short and thick-set, more so than in any of the previously known species, with the anterior division somewhat dilated.

The carapace is evenly arched above and deeply emarginate posteriorly, exposing the dorsal part of the two last segments of the trunk. It has a distinct, though not very sharply marked cervical sulcus, and its inferior margins are evenly incurved in the middle. The frontal margin projects in the middle almost at a right angle, covering a part of the ocular pedicles, and the antero-lateral corners are but slightly produced as rather broad, obtuse-angled lobes.

The caudal segments are all well-nigh of equal length and a little depressed, their breadth being somewhat greater than their height.

The eyes are comparatively small, of a regular ovoid form, and projecting but slightly at the sides. The cornea occupies about one-third of the eye, and has a dark pigment.

The antennular peduncle (fig. 3) is rather short and thick, with the last joint as large as the basal, and the middle joint very obliquely truncate at the end.

The antennal scale (fig. 4) is exceedingly small, scarcely as long as the antennular peduncle, and of an oblong-oval form, about three times as long as broad. It is fringed all round with long setæ (omitted in the figure), and has a very short terminal articulation.

The oral parts could not, of course, be examined closely in the sole specimen before us.

All the legs were broken off, their basal parts only being left.

The marsupial pouch (see fig. 1) was fully developed in the specimen, and contained young, in the so-called pupa stage (figs. 6, 7), agreeing perfectly with those of other Mysidans.

The telson (fig. 5) is of a somewhat triangular form, broadest at the base, and regularly tapering toward the apex. The lateral borders are in greater part quite smooth, armed in their hinder part only, on either side, with about six denticles. The apical incision is very deep, occupying, as it does, fully one-third of the length of the telson, and also rather broad. The edges limiting the incision are quite smooth in their hinder half, whereas a dense fringe of spinules runs along the anterior part, much as in the Norwegian species. The terminal lobes are rather narrow, and bear on the tip two somewhat unequal spines, the outer being the longer.

The uropoda (see fig. 2) do not exhibit any essential difference from those in the other species, their terminal plates being comparatively broad, and the inner plate much shorter than the outer, with the auditory apparatus distinctly developed.

Habitat.—The above-described specimen I took from a small bottle containing specimens of *Paranebalia longipes* (Willemoes-Suhm), collected in shallow water at the Bermuda Islands.

APPENDIX.

NOTES ON SOME PARASITES OBTAINED FROM THE CHALLENGER SPECIMENS OF SCHIZOPODA (Pl. XXXVIII. Figs. 8–23).

In the following pages I purpose directing the attention of zoologists to certain ecto- and endo-parasites found infesting a few of the Challenger Schizopoda I have examined. My intention is not to give full descriptions of these parasites, belonging, as they do, to groups on which I have not been called upon to report. Meanwhile, I have not seen fit to pass them by altogether, seeming, as they do, to exhibit quite a particular interest, and, moreover, since they undoubtedly may serve to complete our knowledge of the biology of the Schizopoda.

Long ago Kröyer recorded [1] a peculiar Bopyridan infesting the Arctic Mysidan, *Mysis oculata*, Fabr., under the name of *Dajus mysidis*, which form has more recently been described by Buchholtz [2] and Hoek [3] under a new generic name, viz., *Leptophryxus*, the latter authors having apparently not been aware of the figures and name given by Kröyer in the above cited work. This form was the only known parasite found on Schizopods, until the author recorded [4] three other Bopyridans, likewise met with on certain Schizopods (*Eurythrops*, *Amblyops*, and *Pseudomma*). These three Bopyridans were found to belong to two distinct genera, viz., *Aspidophryxus*, G. O. Sars, and *Notophryxus*, G. O. Sars. Moreover, the author has observed, on species of the Mysidan genus *Erythrops*, a peculiar Lernæid, apparently the *Spharonella leuckartii* of Salensky. All these forms are, however, true ecto-parasites. No endo-parasites, on the other hand, have as yet been found in any form of Schizopods. But in a few specimens of Euphausiidans from the Challenger Expedition, I have also succeeded in detecting two forms of true endo-parasites, or intestinal worms, one of which, at least, exhibits a most peculiar appearance and certain highly remarkable features. On Pl. XXXVIII. I have given figures of all the parasites met with, for the most part in their natural position on the Schizopods infested by them.

[1] Gaimard's Voyage en Scandinavie, Zoologie.

[2] Die zweite deutsche Polarfahrt., Zoologie.

[3] Die Crustaceen gesammelt wahrend der Fahrten des "Willem Barents" in den Jahren 1878 und 1879.

[4] Oversigt over Norges Crustaceer, i.; and, Crustacea et Pycnogonida nova Expeditionis Norvegicæ.

Ecto-Parasites (Pl. XXXVIII. figs. 8–14).

All these forms belong to the Bopyridan tribe and the family Dajidæ, and occur attached in different parts of the anterior division of the body on certain Schizopoda from the Challenger Expedition. As usual, the dwarfed males are found adhering to the posterior part of the body of the much larger females.

The form represented in fig. 8 exhibits at the first glance, both as regards its external appearance and relative position to the body of the Schizopod, to which it is attached, a striking resemblance to the Norwegian form *Aspidophryxus peltatus*, G. O. Sars. Nevertheless, it cannot properly be referred even to the same genus, since the clasping legs are not, as in that genus, crowded together anteriorly at the sides of a very restricted median area, but are found arranged along the lateral edges of the body, the four anterior pairs occurring at the sides of the anterior half, whereas the posterior pair originate far behind the rest, near the posterior extremity of the body. This posterior pair of legs would seem, moreover, to exhibit a very peculiar structure, having the aspect of two rather large posteriorly directed appendages, bifurcate at the extremity. The body is distinctly segmented along the median part, and mottled there with densely crowded pigment spots, whereas the greatly expanded and vaulted lateral parts are quite smooth and pellucid, admitting of the ovaries, with their numerous ova, to be distinctly traced through their walls. The male (see fig. 8, *b*) is seen adhering to the posterior end of the body of the female, or the rudimentary tail, and would seem to agree in structure with that of *Aspidophryxus*. The above recorded parasite was found on a specimen of *Euphausia pellucida*, Dana, taken off Cape Verde Islands, April 26, 1876, and was mounted, together with the Schizopod itself, in Canada balsam on a glass slide. It may properly be named *Heterophryxus appendiculatus*, n. gen. et sp.

The two forms represented in figs. 9, 10, 11 would seem, as regards their general structure, to agree tolerably well with the species of the genus *Notophryxus*, G. O. Sars, the body being sac-like, with but very slightly indicated segmentation, and with the five pairs of clasping legs crowded together in the anterior part of the ventral face, at the sides of the oral area (see fig. 10). One of the forms (figs. 9, 10) has, however, a rather anomalous position on the Schizopod, not being, as usual, attached to the dorsal face but to one of the sides of the body, or, more precisely, to the base of the penultimate gill, for which reason it may properly be named *Notophryxus lateralis*, n. sp. It was found on two specimens of *Nematoscelis megalops*, G. O. Sars, taken in the South Atlantic, March 9, 1876. The other form (fig. 11) was found attached to the posterior part of the dorsal face of the carapace on a specimen of *Thysanoëssa gregaria*, G. O. Sars, taken July 10, 1875, in the North Pacific. Owing to its comparatively short and thick-set body, this form may be termed *Notophryxus globularis*, n. sp.

The fourth form, finally (figs. 12, 13, 14), evidently belongs to the genus *Dajus*.

Kröyer, though unquestionably distinct from the Arctic form *Dajus mysidis*, Kröyer. The adult female (figs. 12, 13) has, in its external appearance, a very striking similarity to certain parasitic Copepoda, the anterior division of the body being greatly expanded and of a rounded triangular form, with a slightly indicated segmentation, whereas the posterior part, or tail, is abruptly narrowed, more distinctly segmented, and terminates in two simple lamelliform appendages, reminding one of the so-called furca of the Copepoda. The five pairs of clasping legs are (see fig. 13) crowded together on either side of the buccal area, which occupies about the centre of the ventral face of the anterior division. The male (figs. 12, 13, *a*, 14) differs, as in the typical species, materially from the males of the preceding forms, in having the tail distinctly segmented and furnished with well-developed pleopoda, as also with a pair of biramous uropoda. It is found with its anterior part deeply immersed in a hollow space of the female, lying ventrally at the end of the anterior division, and partly defined by two wing-like, posteriorly pointing cuticular folds (see fig. 13), the remaining part of its body projecting freely behind in the same axis as that of the female. Both the female and the male, but more especially the latter, are variegated with dark pigment deposits over their dorsal face. This peculiar form was found attached to the ventral face of the trunk posteriorly on a few specimens of *Siriella thompsoni* (Milne-Edwards), both males and females, in the latter lying partly within the marsupial pouch, as was also the case with *Dajus mysidis*. It may justly be named *Dajus siriellæ*, n. sp.

Endo-Parasites (Pl. XXXVIII. figs. 15–23).

The two forms of parasites treated on under this head were both found within the body cavity of certain Euphausiidæ, their bodies freely suspended in the perivisceral fluid of the Schizopods, and not covered by any particular envelope or cyst. They evidently belong to two different groups of intestinal worms, the one being an Acanthocephalan, the other a Trematode. Concerning both, I have thought it right to consult the celebrated German Professor Rudolf Leuckart, unquestionably the greatest authority as regards intestinal worms, and he has most cordially given me his suggestions respecting the present interesting forms. None of them can, according to Professor Leuckart, be regarded as sexually mature, but represent a mere transitory stage, that probably does not arrive at full maturity, before being transferred into the intestinal canal of some higher animals, most likely fishes or whales, which are both known to feed largely upon Euphausiidæ. In their present stage of development they simply absorb through the skin the perivisceral fluid, in which their bodies are suspended, and are thus placed under particularly favourable conditions of life, whence their comparatively large size, in proportion to the size of the Schizopods infested by them.

The form represented in figs. 15–18 is readily recognised as a species of the genus

Echinorhynchus, Müller, more especially by the cylindrical proboscis (see fig. 17), protruding from the ventral face of the anterior extremity, and armed with numerous strongly chitinised recurved hooks (fig. 18). The body (see fig. 16) is rather elongate and somewhat flattened, irregularly wrinkled transversely, and obtusely rounded at both ends. It was found within the body cavity of a specimen of *Euphausia pellucida*, Dana, occupying the greater part of its length, and bent, moreover, in the form of the letter S (fig. 15). The species may, on account of its irregularly wrinkled body, be properly named *Echinorhynchus corrugatus*, n. sp.

The other form (figs. 19–23) exhibits a very peculiar appearance, but may nevertheless be undoubtedly determined as a species of the genus *Distomum*, Zed., since it presents two well-defined sucking disks, the one anterior, or oral, the other ventral. The body is not, as usual, flattened, but cylindrical and twisted in a peculiar manner, having, moreover, the ventral sucking disk mounted at the end of a cylindrical peduncle that stands out at right angles from the body. The integument is rather firm and muscular, as also densely wrinkled transversely throughout its anterior half, but rather pellucid, so as to admit of the two spirally twisted intestinal cæca being distinctly traced within the body. The most peculiar feature of this form is, however, the mode in which it is affixed within the body cavity of the Schizopod. For this is not effected by any of the sucking disks, but with the aid of a kind of byssus excreted from the posterior end of the animal and dispersed within a peculiar sac-like body, lying transversely within the posterior part of the body cavity of the Schizopod (see fig. 19), and at least with one of its extremities firmly connected with the outer skin, thus often producing a conspicuous mamilliform projection behind the posterior gill (see Pl. XXIII. fig. 10). Whether this peculiar body ought to be referred to the parasite itself, or possibly should be regarded as a pathological product of the Schizopod, is still uncertain. On opening the body just mentioned, the byssus is found to consist of two rather strong filaments (see figs. 21, 22), more or less twisted upon themselves, as a rope, and of a number of very fine and highly adhesive fibres (fig. 23), partly curled up in globular masses, and partly stretching along the two filaments. The slightest touching of the byssus with any object will cause such objects to adhere rather firmly thereto, even in spirit-specimens. This very peculiar intestinal worm I found in several specimens of the two Euphausiidans, *Nematoscelis megalops*, G. O. Sars, and *Thysanoëssa gregaria*, G. O. Sars, from the South Atlantic, invariably affixed within the body cavity of the Schizopod in the same peculiar manner, the body itself with its sucking disks being freely suspended anteriorly within the perivisceral fluid, and, as a rule, a little asymmetrically, towards the right or left side of the intestinal canal of the Schizopod. Professor Leuckart has proposed to designate the species *Distomum filiferum*, n. sp., and will give a short account of its structure in an Appendix to one of the forthcoming Zoological Reports.

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(Synonyms and Species incidentally mentioned are in *italics*.)

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PLATE 1.

Figs. 1–7. *Lophogaster typicus*, M. Sars.

Fig. 1. Adult male, from left side; magnified about five times.

Fig. 2. Female, from above.

Fig. 3. Anterior part of carapace of male, along with eyes, antennulæ and antennæ, viewed from above.

Fig. 4. Basal part of a female antenna, with antennal scale and proximal section of flagellum, from below.

Fig. 5. Leg of last pair.

Fig. 6. Posterior extremity of tail, with caudal fan, from above.

Fig. 7. Extremity of telson; more highly magnified.

Figs. 8–17. *Ceratolepis hamata*, G. O. Sars.

Fig. 8. Female, from left side; magnified about ten times.

Fig. 9. Same, from above.

Fig. 10. Anterior part of carapace, with eyes, from above; somewhat more magnified.

Fig. 11. Anterior part of body, viewed from the ventral face, showing antennulæ (a'), antennæ (a^2), antennal scale (sq), anterior lip (L), mandibles (M), mandibular palps (p), second pair of maxillæ (mx^2), maxillipeds (mp'), with their rudimentary exopodite (e).

Fig. 12. Base of an antenna, with antennal scale.

Fig. 13. One of the gnathopods.

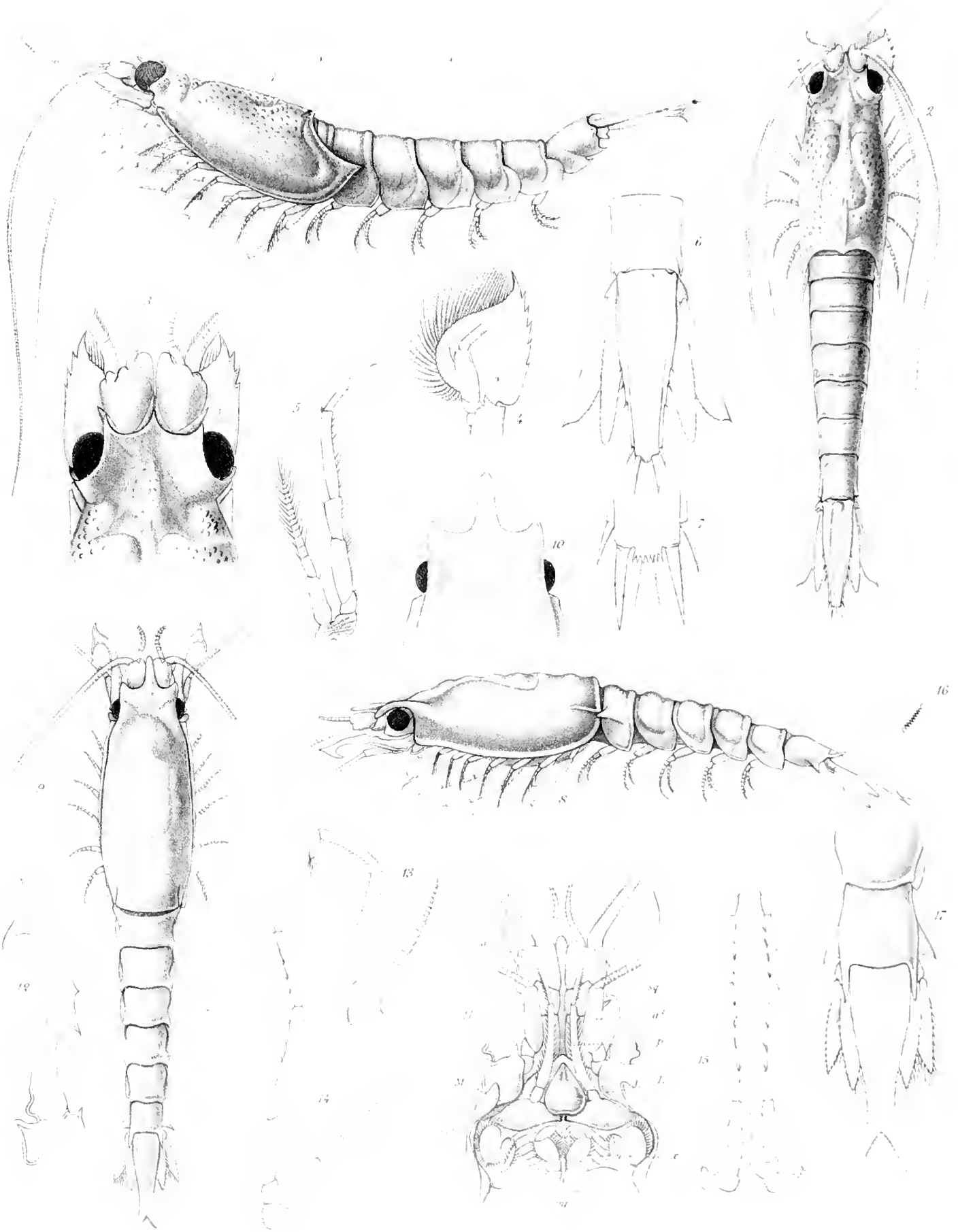
Fig. 14. One of the legs.

Fig. 15. Posterior pair of legs, with the corresponding pair of incubatory lamellæ and the rudimentary exopods.

Fig. 16. A caudal epimeron, lateral aspect.

Fig. 17. Extremity of tail, with caudal fan, from above.

Note.—The figures on all the plates have been drawn by the author with the aid of the camera lucida.



Figs 1–7, LOPHOGASTER TYPICUS, M. Sars
„ 8–17. CERATOLEPIS HAMATA, n. gen. & sp.

PLATE II.

PLATE II.

Gnathophausia ingens (Dohrn).

Fig. 1. Adult female, from right side; natural size.

Fig. 2. Same, from above.

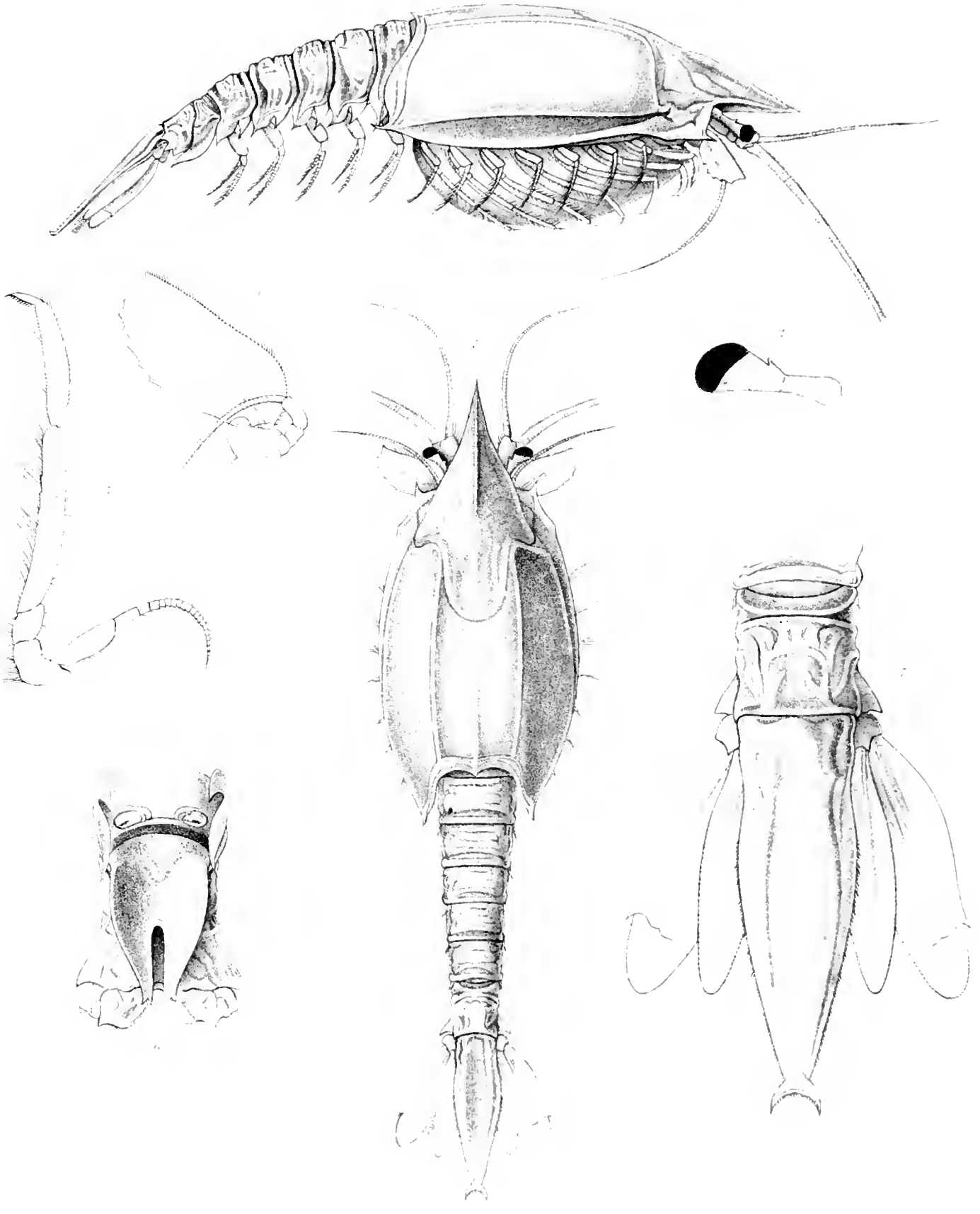
Fig. 3. An eye.

Fig. 4. Antenna, with scale and proximal part of flagellum.

Fig. 5. One of the legs.

Fig. 6. The two last segments of tail, together with basal parts of uropoda, from below exhibiting the peculiar epimeral plates of last segment.

Fig. 7. Extremity of tail, with caudal fan, from above.



GNATHOPHAUSIA INGENS, (Dohrn)

PLATE III.

PLATE III.

Euphausia gigas, Willemoes-Suhm.

Fig. 1. Adult male, from left side ; natural size.

Fig. 2. Same, from above.

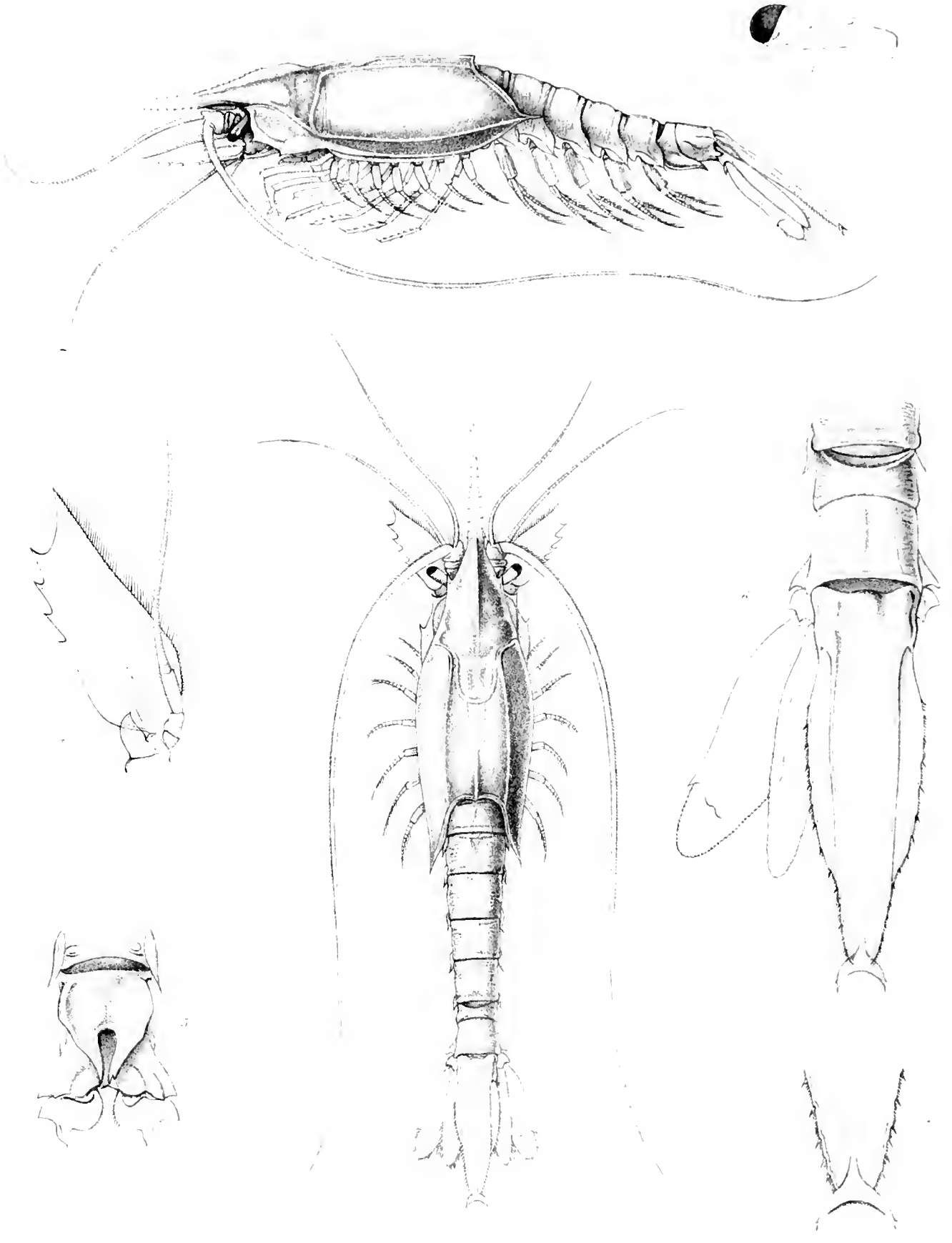
Fig. 3. An eye.

Fig. 4. Antenna, with scale and flagellum.

Fig. 5. Last caudal segment, with basal parts of uropoda, from below, exhibiting the confluent epimeral plates.

Fig. 6. Extremity of tail, with telson and right uropod, from above.

Fig. 7. Tip of telson ; somewhat more magnified.



GNATHOPHAUSIA GIGAS Willem Subs.

PLATE IV.

PLATE IV.

Gnathophausia calcarata, G. O. Sars.

Fig. 1. Adult male, from right side ; very slightly magnified.

Fig. 2. Same, from above.

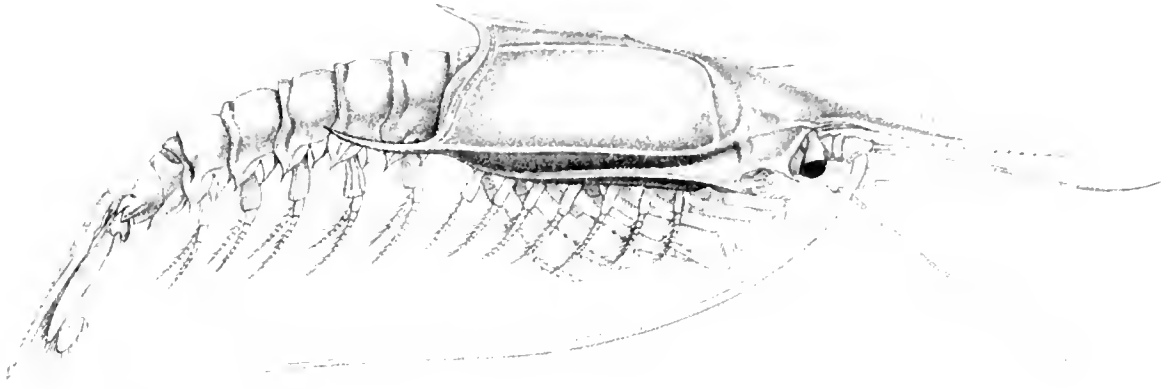
Fig. 3. Carapace of another somewhat smaller specimen, from below. *a*, supra-orbital spines (?) ; *b*, antennal spines ; *c*, branchiostegal spines.

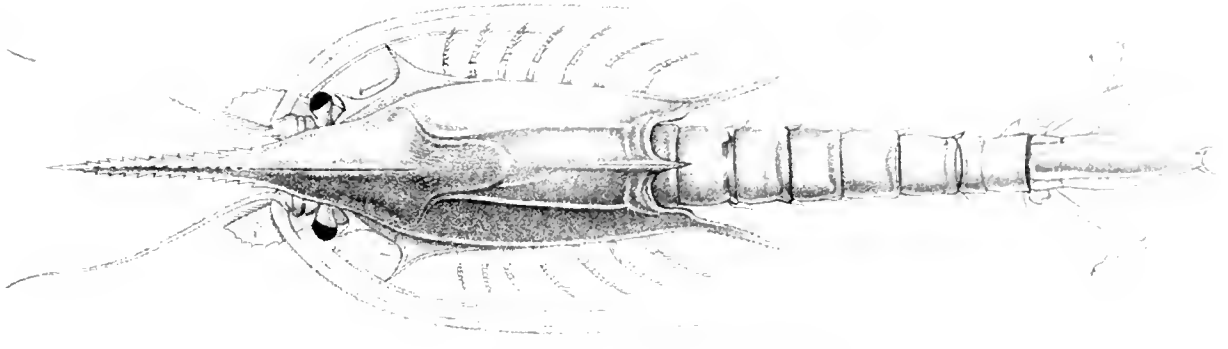
Fig. 4. Anterior part of body, from below, exhibiting eyes, antennulæ (a'), antennæ (a^2), anterior lip (*L*), mandibles (*M*), mandibular palps (*Mp*), second pair of maxillæ (m^2), with their exognaths (*fl*), and the pigmented basal protuberance (*x*), maxillipeds (mp'), with their rudimentary exopodite (*p*).

Fig. 5. Antenna, with scale and proximal part of flagellum.

Fig. 6. Last caudal segment, from below, exhibiting the confluent epimeral plates.

Fig. 7. Extremity of tail, with caudal fan, from above.





GNATHOPHAUS AURICARATA

PLATE V.

PLATE V.

Figs. 1–6. *Gnathophausia willemoesii*, G. O. Sars.

Fig. 1. Adult female, from left side; natural size.

Fig. 2. Same, from above.

Fig. 3. An eye.

Fig. 4. Antenna, with scale and flagellum.

Fig. 5. The two last caudal segments, with basal parts of uropoda, from below.

Fig. 6. Telson, from above.

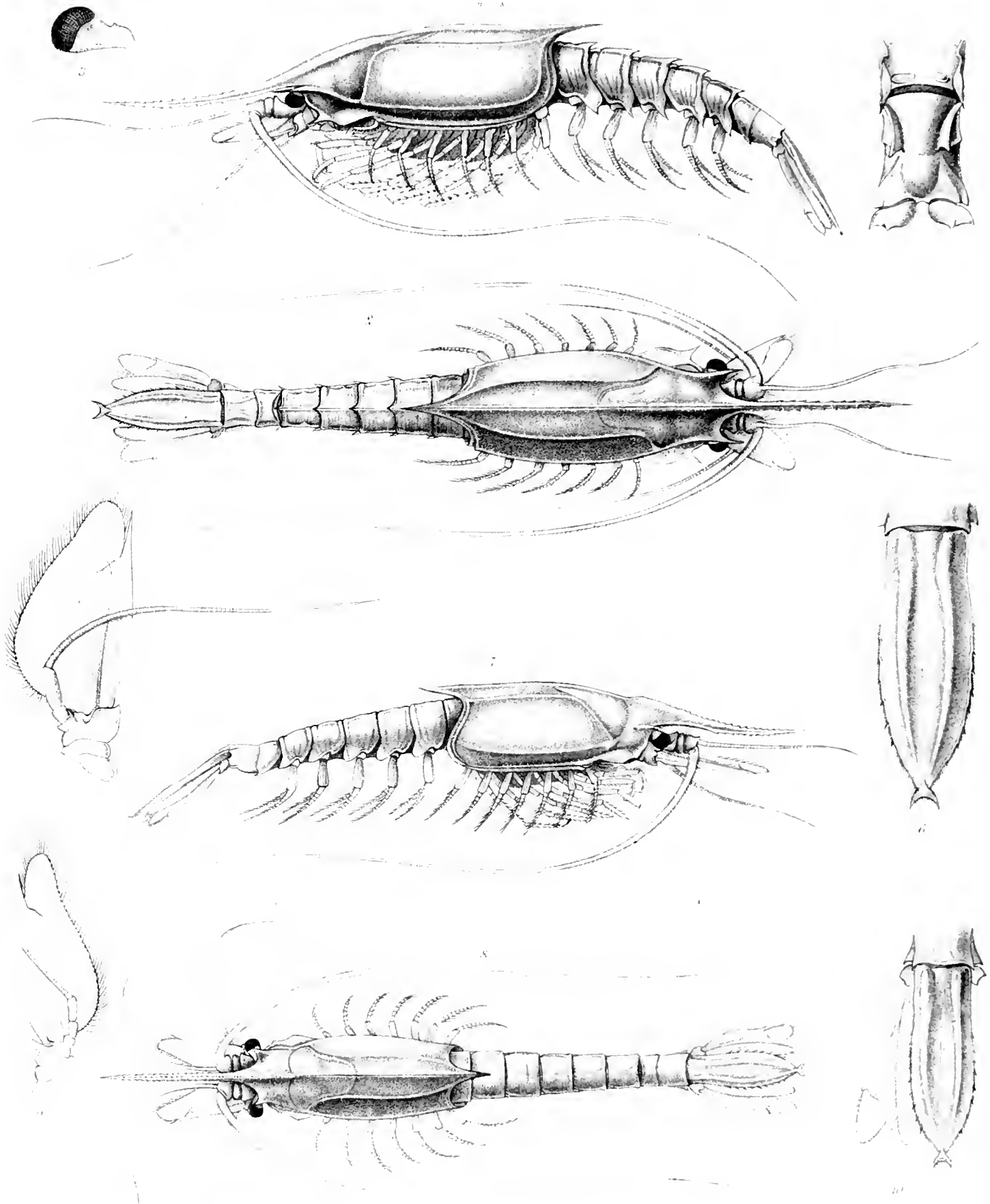
Figs. 7–10. *Gnathophausia affinis*, G. O. Sars.

Fig. 7. Female, from right side; slightly magnified.

Fig. 8. Same, from above.

Fig. 9. Antenna, with scale and proximal part of flagellum.

Fig. 10. Extremity of tail, with telson and right uropod, from above.



Figs 1–6. GNATHOPHAUSIA WILLEMOESII, n. sp.
" 7–10. " AFFINIS, n. sp.

PLATE VI.

PLATE VI.

Figs. 1–5. *Gnathophausia elegans*, G. O. Sars.

Fig. 1. Female, from left side ; magnified about three times.

Fig. 2. Same, from above.

Fig. 3. Antenna, with scale and proximal part of flagellum.

Fig. 4. Telson, from above.

Fig. 5. Extremity of same; more highly magnified.

Figs. 6–10. *Gnathophausia zoëa*, Willemoes-Suhm.

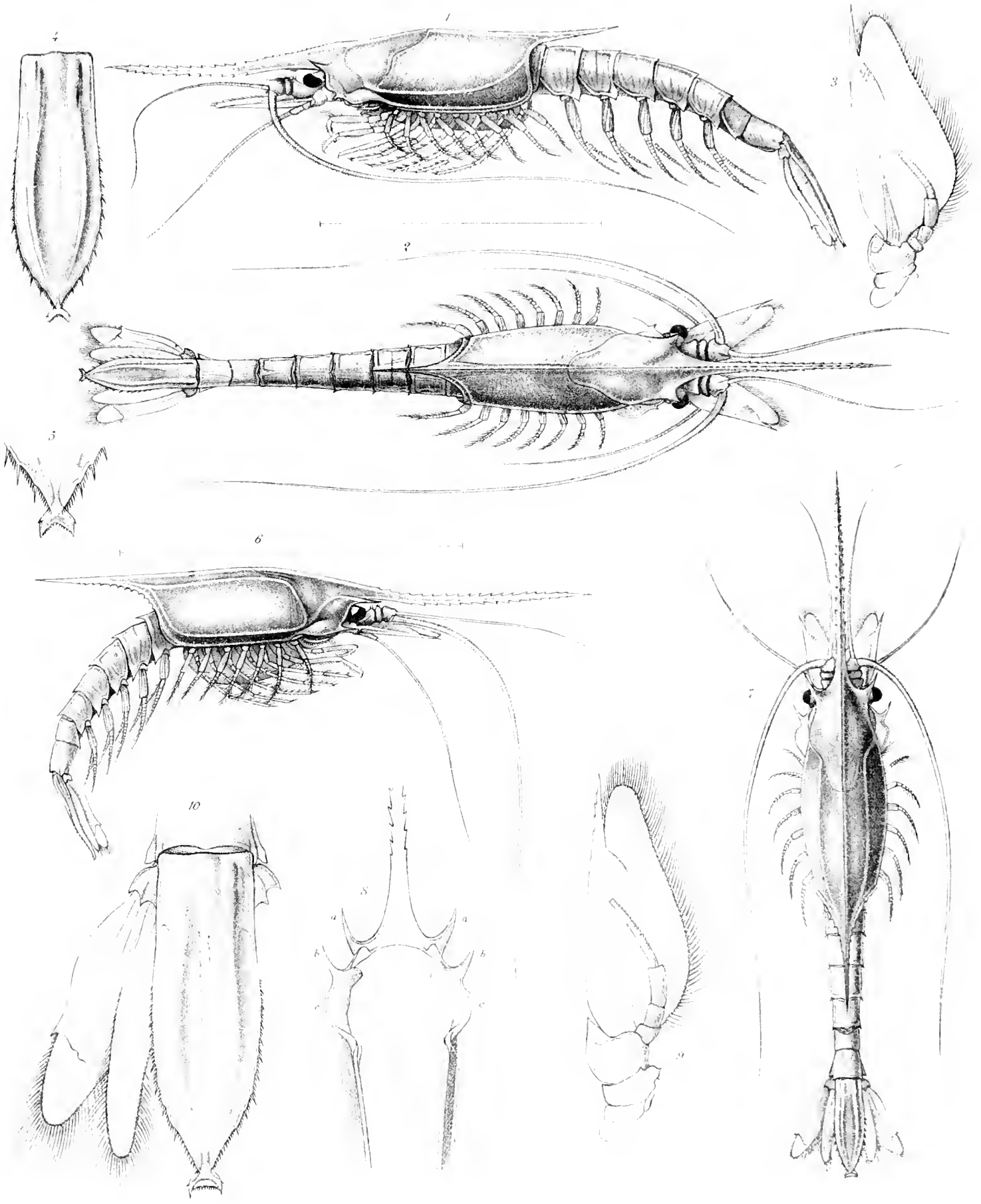
Fig. 6. Adult female, from right side : twice the natural size.

Fig. 7. Same, from above.

Fig. 8. Anterior part of carapace, with base of rostrum, from below. *a*, supra-orbital spines ; *b*, antennal spines ; *c*, branchiostegal expansions.

Fig. 9. Antenna, with scale and proximal part of flagellum.

Fig. 10. Extremity of tail, with telson and right uropod, from above.



Figs 1–5. GNATHOPHAUSIA ELEGANS, n sp
" 6–10, " ZOEA. Willem Sunm

PLATE VII.

PLATE VII.

Figs. 1–5. *Gnathophausia longispina*, G. O. Sars.

Fig. 1. Adult male, from left side ; magnified about three times.

Fig. 2. Same, from above.

Fig. 3. Antenna, with scale and proximal part of flagellum.

Fig. 4. Extremity of tail, with telson, from above.

Fig. 5. Anterior part of carapace, with base of rostrum, from below. *a*, supra-orbital spines ; *b*, rudiments of antennal spines ; *c*, branchiostegal spines.

Figs. 6–10. *Gnathophausia gracilis*, Willemoes-Suhm.

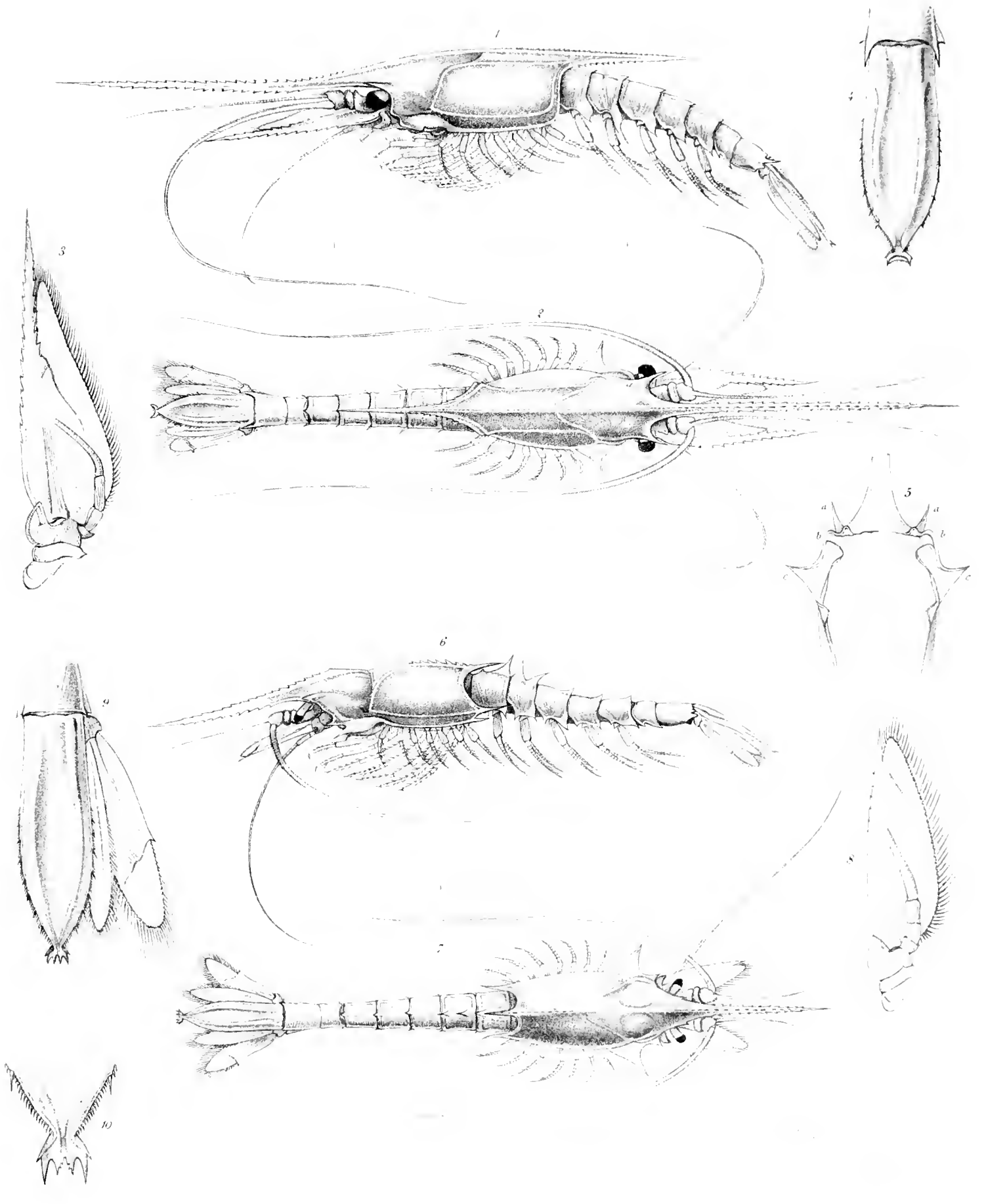
Fig. 6. Male, from left side ; magnified about three times.

Fig. 7. Same, from above.

Fig. 8. Antenna, with scale and proximal part of flagellum.

Fig. 9. Extremity of tail, with telson and right uropod, from above.

Fig. 10. Tip of telson ; more highly magnified.



Figs 1–5, GNATHOPHAUSIA LONGISPINA n sp
„ 6–10, „ GRACILIS Willem Sunm

PLATE VIII.

PLATE VIII.

Gnathophausia longispina, G. O. Sars.

(Anatomy).

Fig. 1. Ocular segment, with right eye (*o*) and right antennular pedunele, from above.

Fig. 2. Anterior lip (*L*) and mandibles with their palps, from below.

Fig. 3. Terminal joint of mandibular palp; more highly magnified.

Fig. 4. Cutting edges of mandibles.

Fig. 5. Posterior lip.

Fig. 6. Maxillæ of first pair, with palp.

Fig. 7. Maxillæ of second pair. *p*, palp; *ex*, exognath; *x*, pigmented basal protuberance.

Fig. 8. Maxilliped. *x*, concave surface occurring in place of the exopodite; *ep*, epipodite.

Fig. 9. Leg of first pair, or gnathopod, with attached gill.

Fig. 10. Leg of second pair. *ep*, rudimentary epipod.

Fig. 11. Bases of a pair of legs, with the attached gills *in situ*.

Fig. 12. Gill, isolated.

Fig. 13. Extremity of a gill-branch; more highly magnified.

Fig. 14. Leg of last pair, with male sexual aperture (*p*) and the rudimentary gill (*br*).

Fig. 15. Male sexual aperture; more highly magnified.

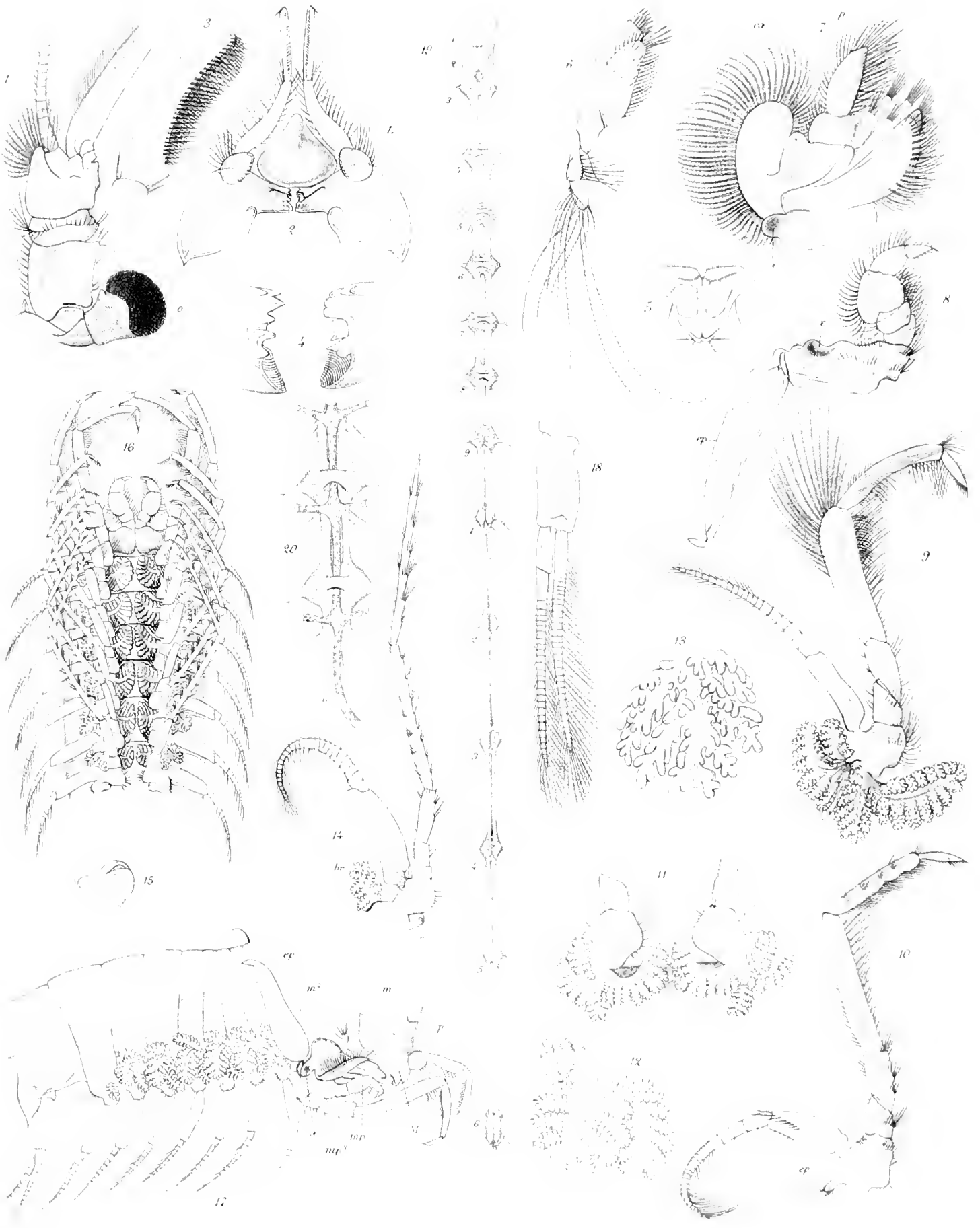
Fig. 16. Trunk, with maxillipeds, legs, and gills *in situ*, viewed from the ventral face.

Fig. 17. Trunk, together with first caudal segment and oral parts, from right side. The carapace is removed to show the seven segments of the trunk with their gills. *L*, anterior lip; *M*, mandible; *p*, mandibular palp; m', maxilla of first pair; m^2, maxilla of second pair; *x*, pigmented basal protuberance of same; mp', maxilliped; *ep*, epipodite of same; mp^2, leg of first pair or gnathopod.

Fig. 18. A pleopod.

Fig. 19. Chain of ventral ganglia; 1–9 those belonging to anterior division, following (1–6) caudal.

Fig. 20. Part of the anterior division of the chain, together with the great ventral artery (*a*); more highly magnified.



GNATHOPHAUSIA LONGISPINA.

Anatomy.

PLATE IX.

PLATE IX.

Eucopia australis, Dana.

Fig. 1. Adult female with marsupial pouch, from right side; magnified about three times. The exterior parts of the four posterior pairs of legs were broken off.

Fig. 2. Same, from above.

Fig. 3. Ocular segment, with left eye and antennular peduncles, from above.

Fig. 4. Antenna, with scale and proximal part of flagellum.

Fig. 5. Anterior lip and mandibles *in situ*, from below.

Fig. 6. Masticatory parts of mandibles, exhibiting the armature of the cutting edges.

Fig. 7. Last joint of mandibular palp.

Fig. 8. Posterior lip.

Fig. 9. Maxilla of first pair.

Fig. 10. Extremity of outer masticatory lobe of same; more highly magnified.

Fig. 11. Maxilla of second pair.

Fig. 12. Maxilliped, with the rudimentary exopodite and greatly developed epipodite.

Fig. 13. Extremity of endopodite of same: more highly magnified.

Fig. 13 (*bis*). Leg of first pair, or first gnathopod, with attached gill.

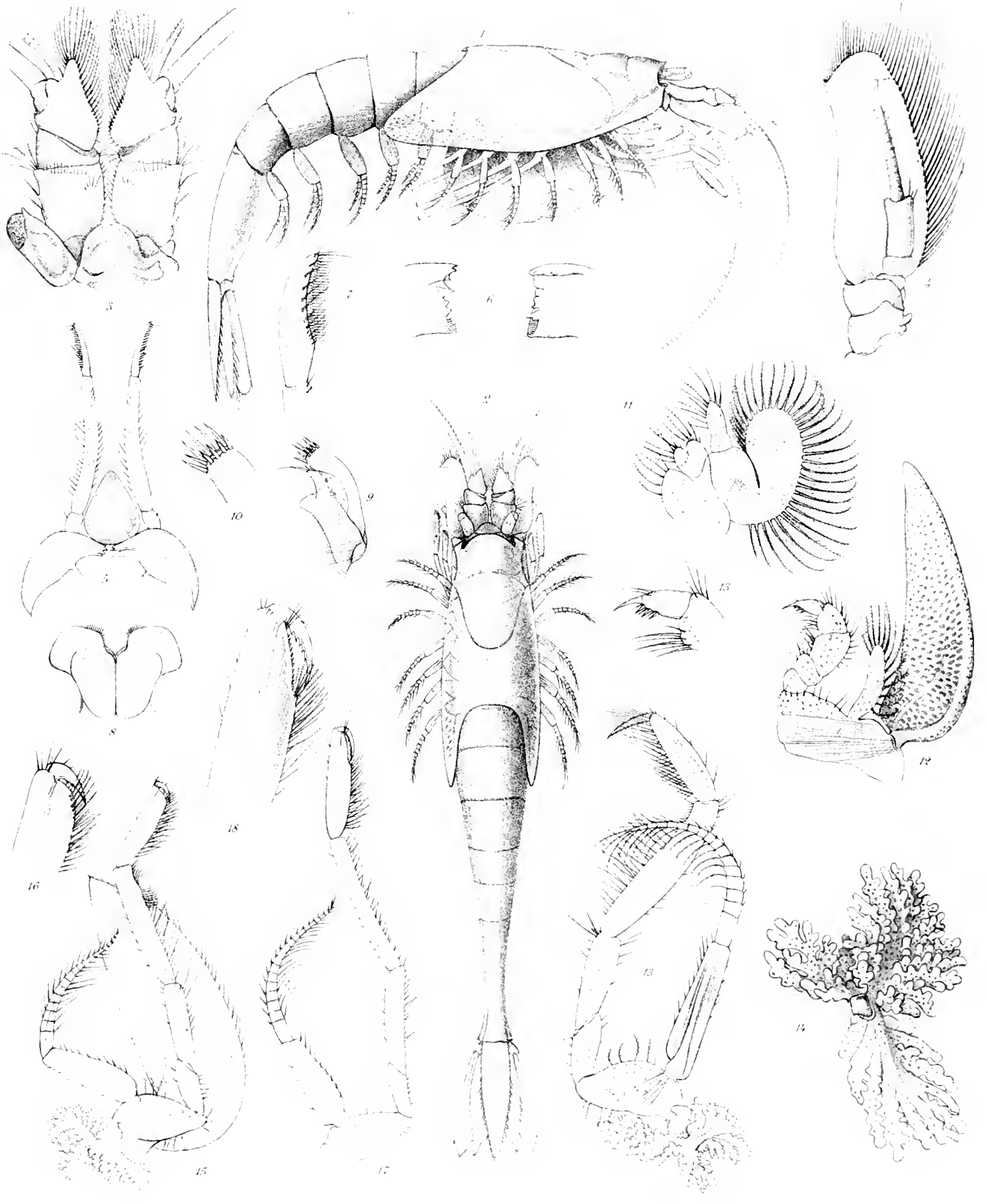
Fig. 14. Gill of same, isolated and more highly magnified.

Fig. 15. Leg of second pair, or second gnathopod, with attached gill and incubatory lamella.

Fig. 16. Extremity of same; more highly magnified.

Fig. 17. Leg of third pair, or third gnathopod.

Fig. 18. Extremity of same; more highly magnified.



EUCOPIA AUSTRALIS, Dana

PLATE X.

PLATE X.

Eucopia australis, Dana.

(*Continued*).

Fig. 1. Young female, with all its limbs uninjured, from left side: magnified about four times.

Fig. 2. Trunk, from left side, with attached limbs; carapace removed to show the segments and gills. *ep*, epipodite of maxilliped.

Fig. 3. Extremity of a gill-branch.

Fig. 4. One of its lobes; highly magnified.

Fig. 5. Leg of fourth pair, with attached gill.

Fig. 6. Extremity of same; more highly magnified.

Fig. 7. Extremity of a leg of last pair.

Fig. 8. A pleopod.

Fig. 9. Extremity of tail, with telson and left uropod, from above.

Fig. 10. Tip of telson; more highly magnified.

Fig. 11. Exterior corner, with part of apical edge of outer plate of uropod.

Fig. 12. Part of the nervous cord, comprising seven ganglia of the trunk and three caudal.

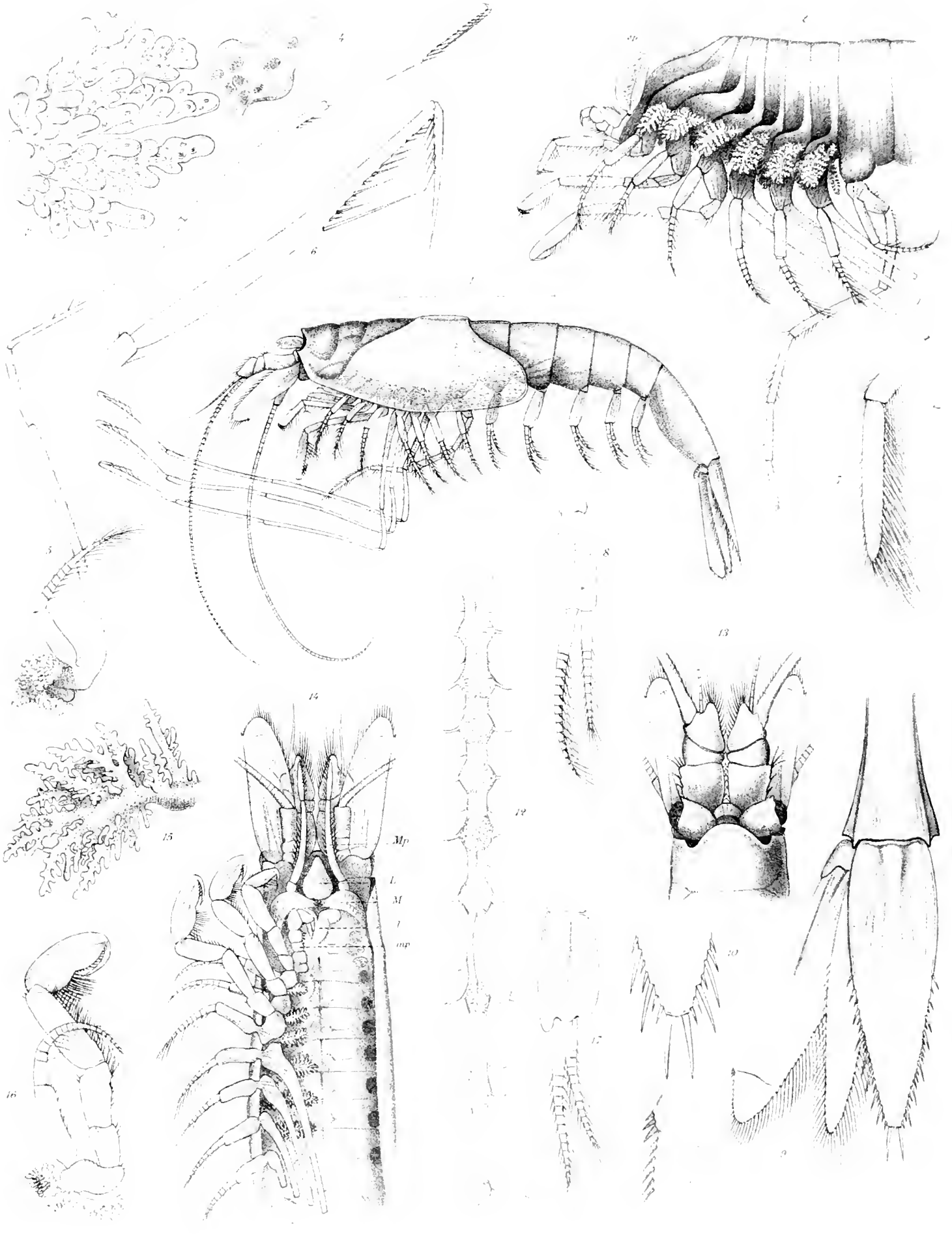
Fig. 13. Cephalic part of body of a male specimen, with eyes, antennulæ and antennæ, from above.

Fig. 14. Anterior part of body of same, from below. *L*, anterior lip; *M*, mandibles; *Mp*, mandibular palp; *l*, posterior lip; *mp*, maxilliped. The limbs behind the mandibles are only represented on the right side.

Fig. 15. A gill-branch of same.

Fig. 16. One of the posterior gnathopodous legs of same.

Fig. 17. A male pleopod.



EUCOPIA AUSTRALIS Dana

PLATE XI.

PLATE XI.

Euphausia pellucida, Dana.

Fig. 1. Adult female, from right side; magnified about nine times.

Fig. 2. Same, from above, showing the luminous globules shining through the integument.

Fig. 3. Preanal spine; highly magnified.

Fig. 4. Adult male, from left side.

Fig. 5. Anterior part of body of a female specimen, together with first caudal segment, from right side, showing the internal organs shining through the carapace. *st*, stomach; *l*, liver; *i*, intestine; *h*, heart; *ov*, ovary; *ovd*, oviduct.

Fig. 6. Carapace, with eyes, antennular peduncles; antennæ, anterior lip (*L*), mandibles (*M*), mandibular palps (*Mp*), and heart (*h*), from below.

Fig. 7. Ocular segment, with left eye, from below. *a*, larval eye or ocellus; *b*, luminous organ.

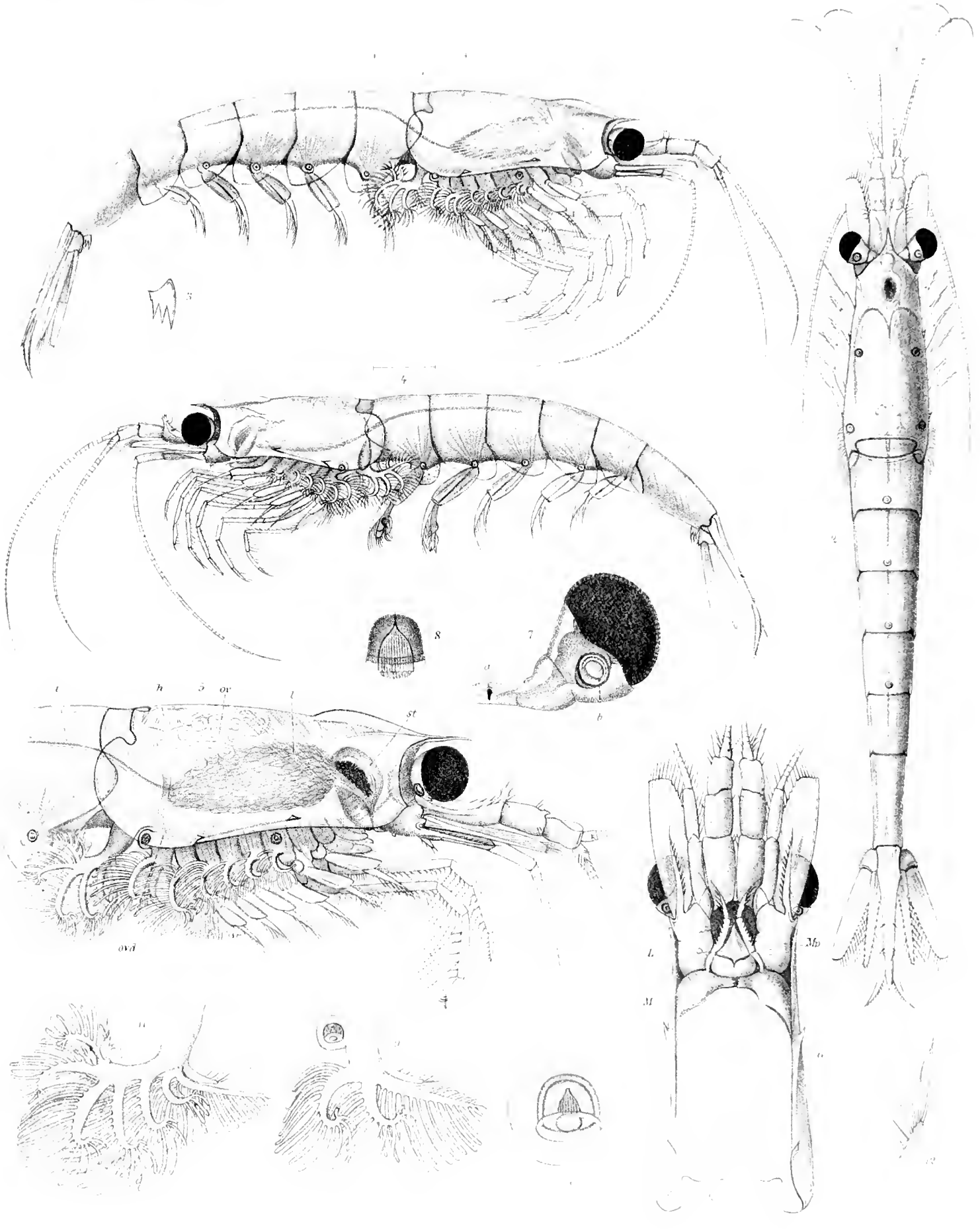
Fig. 8. Luminous organ of ocular pedicle, isolated and highly magnified.

Fig. 9. Gill of antepenultimate pair, with the bulbous basal expansion containing a luminous globule.

Fig. 10. The latter part; more highly magnified.

Fig. 11. Gill of last pair.

Fig. 12. Rudiment of a leg of penultimate pair; highly magnified.



EUPHAUSIA PELLUCIDA Dana

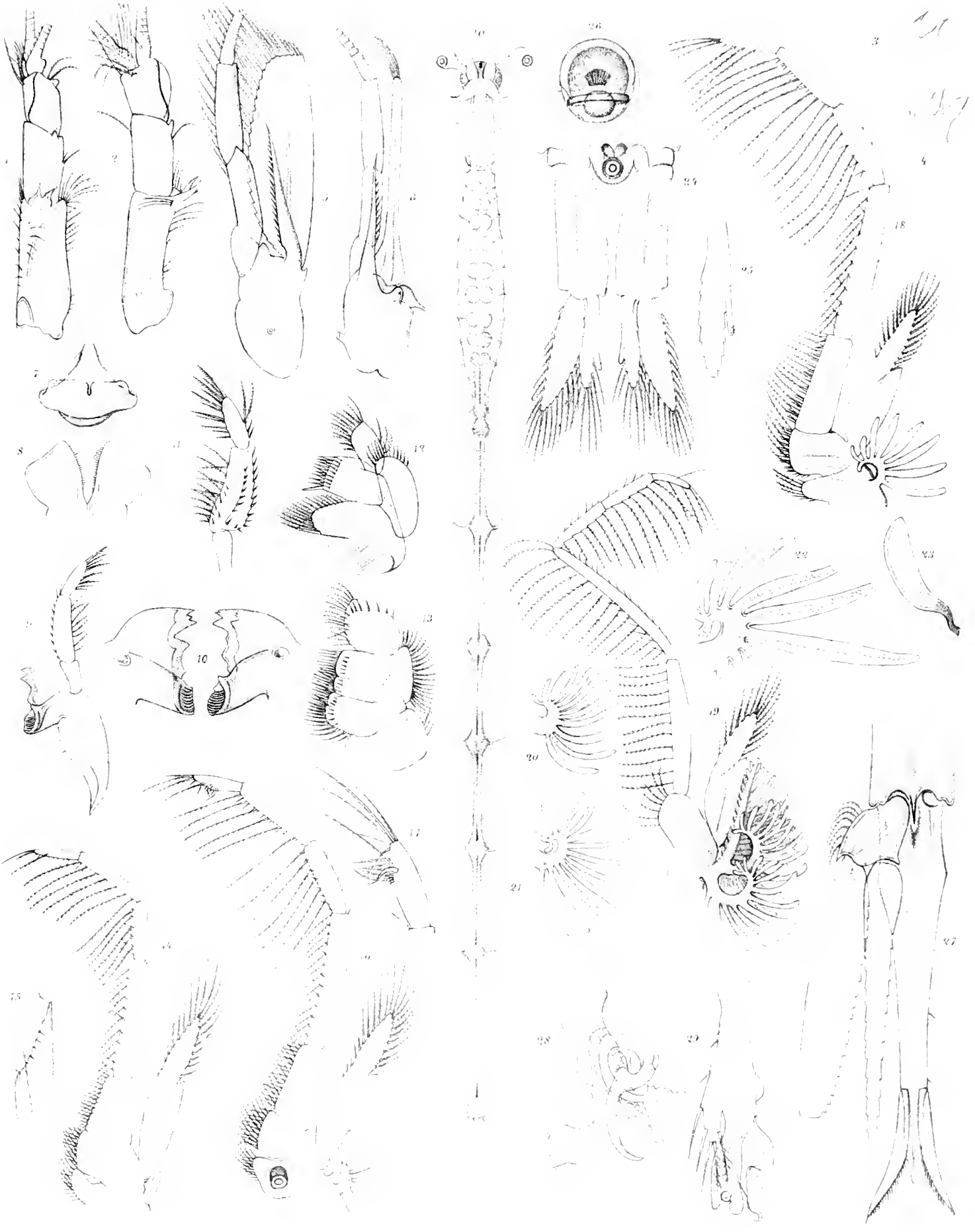
PLATE XII.

PLATE XII.

Euphausia pellucida, Dana.

(Anatomy—*continued.*)

Fig. 1. Right antennular peduncle, from above.
Fig. 2. Same, from inner side.
Fig. 3. Dorsal leaflet of same; highly magnified.
Fig. 4. Dorsal leaflet of another specimen, exhibiting numerous pointed lappets.
Fig. 5. Left antenna, with scale and proximal part of flagellum, from below.
Fig. 6. Same, from the outer side.
Fig. 7. Anterior lip.
Fig. 8. Posterior lip.
Fig. 9. Mandible.
Fig. 10. Masticatory parts of mandibles, more highly magnified, exhibiting the armature of the cutting edges.
Fig. 11. Mandibular palp.
Fig. 12. Maxilla of first pair.
Fig. 13. Maxilla of second pair.
Fig. 14. Maxilliped.
Fig. 15. Extremity of same; more highly magnified.
Fig. 16. Leg of first pair, with attached gill.
Fig. 17. Terminal joint of same; more highly magnified.
Fig. 18. Leg of second pair, with attached gill.
Fig. 19. Leg of antepenultimate pair, with attached gill.
Fig. 20. Gill of third pair.
Fig. 21. Gill of fourth pair.
Fig. 22. Extremity of a gill-stem, with seven of the digitiform lobules, highly magnified.
Fig. 23. Spermatophore found affixed to the genital orifice of a female specimen.
Fig. 24. A pair of pleopods of a female specimen, with the luminous organ projecting between their bases.
Fig. 25. Inner branch of a pleopod, without the marginal setæ.
Fig. 26. Luminous globule from the tail, isolated and highly magnified.
Fig. 27. Extremity of tail, with telson and right uropod, from below.
Fig. 28. Inner branch of a male pleopod of first pair, exhibiting the peculiar copulatory appendages.
Fig. 29. Inner branch of a male pleopod of second pair.
Fig. 30. Central part of the nervous system (nervous cord), with all the ganglia in their natural connection with each other, from below.



EUPHAUSIA PELLUCIDA Dana

PLATE XIII.

PLATE XIII.

Figs. 1–6. *Euphausia similis*, G. O. Sars.

Fig. 1. Adult male, from right side; magnified about six times.

Fig. 2. Anterior extremity of body, with eyes, antennulæ and antennæ, from above.

Fig. 3. Inner plate of a male pleopod of first pair.

Fig. 4. Inner plate of a male pleopod of second pair.

Fig. 5. Extremity of tail, with caudal fan, from above.

Fig. 6. Extremity of last caudal segment, with base of telson and uropods, from right side, more highly magnified, showing the simple preanal spine.

Figs. 7–17. *Euphausia splendens*, Dana.

Fig. 7. Adult female with spermatophores, from right side; magnified about seven times.

Fig. 8. Right antennular peduncle, from above.

Fig. 9. Right antenna, from below.

Fig. 10. Mandibular palp.

Fig. 11. Maxilla of first pair

Fig. 12 Maxilla of second pair

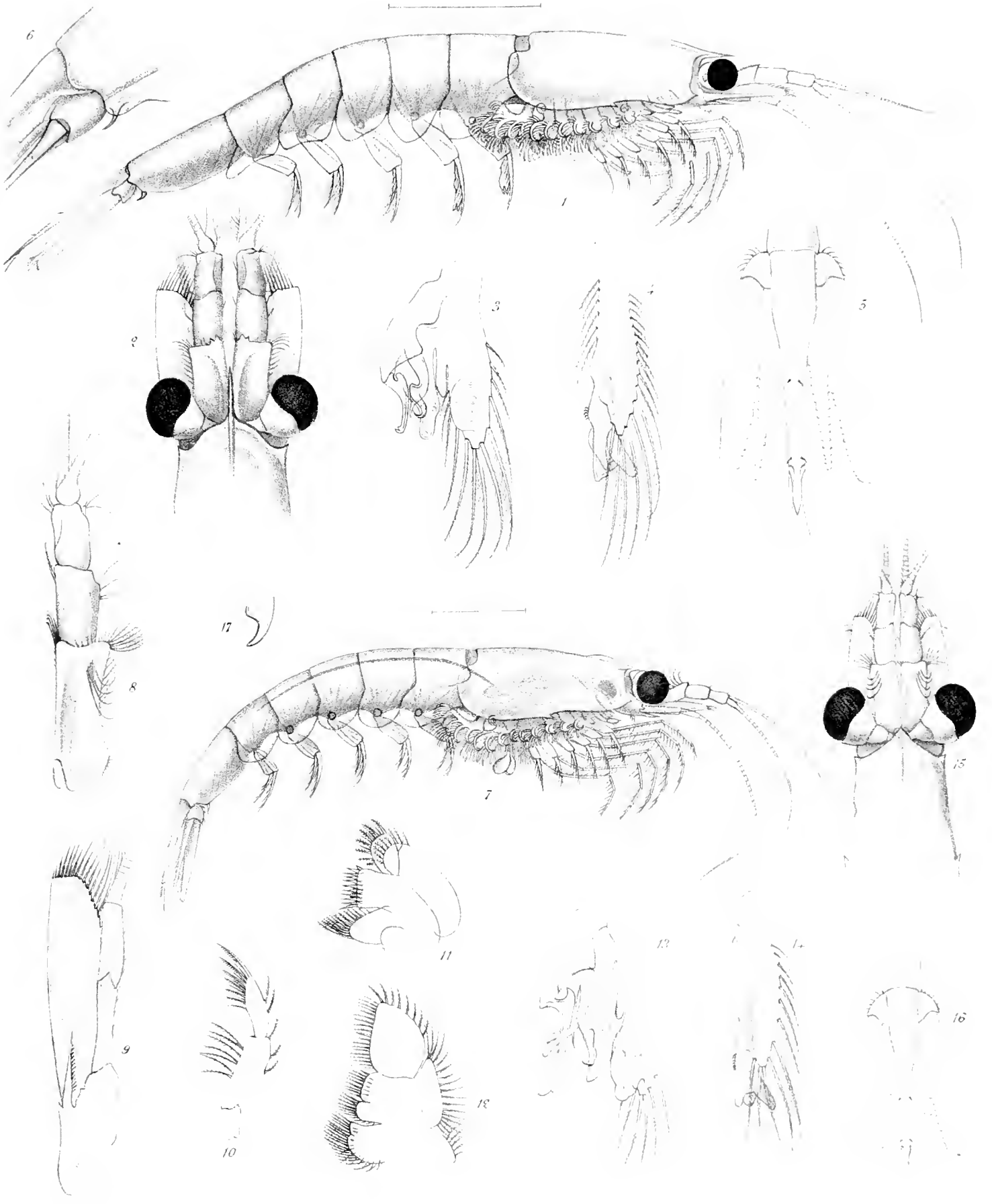
Fig. 13. Inner plate of a male pleopod of first pair.

Fig. 14. Inner plate of a male pleopod of second pair.

Fig. 15. Anterior part of body, from above.

Fig. 16. Extremity of tail, with caudal fan, from above.

Fig. 17. Preanal spine.



Figs 1–6 EUPHAUSIA SIMILIS, n sp
" 7–17 " SPLENDENS Dana

PLATE XIV.

PLATE XIV.

Figs. 1–4. *Euphausia murrayi*, G. O. Sars.

Fig. 1. Female, from right side ; magnified about four times.

Fig. 2. Anterior part of body, from above.

Fig. 3. One of the anterior gills.

Fig. 4. Extremity of tail, with caudal fan, from above.

Figs. 5–9. *Euphausia superba*, Dana.

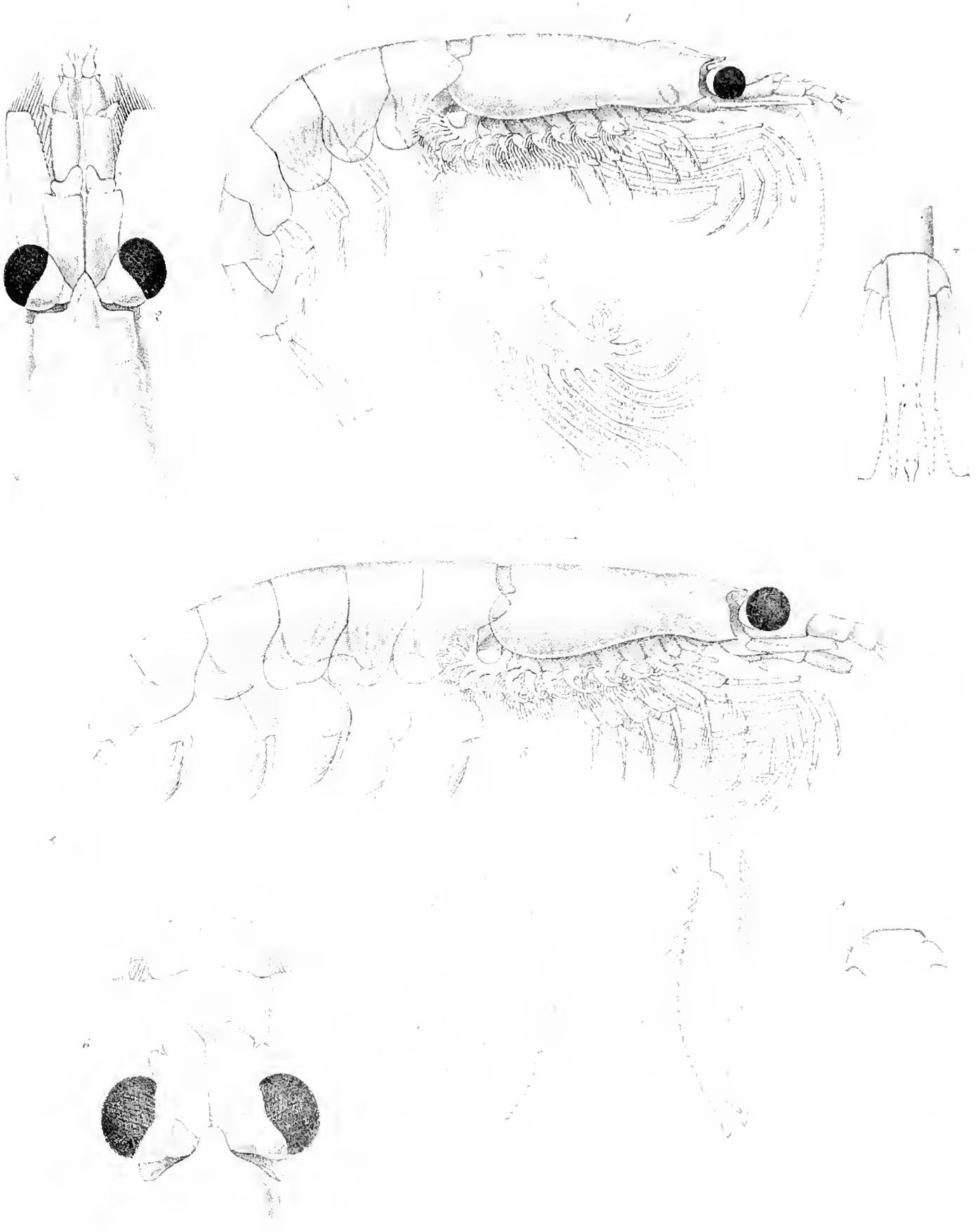
Fig. 5. Adult male, from right side ; magnified about four times.

Fig. 6. Anterior part of body, from above.

Fig. 7. Inner plate of a male pleopod of first pair.

Fig. 8. Inner plate of a male pleopod of second pair.

Fig. 9. Extremity of tail, with caudal fan, from above.



Figs. 1–4. EUPHAUSIA MURRAYI
5–9. SUPERBA Dana

PLATE XV.

PLATE XV.

Figs. 1–8. *Euphausia antarctica*, G. O. Sars.

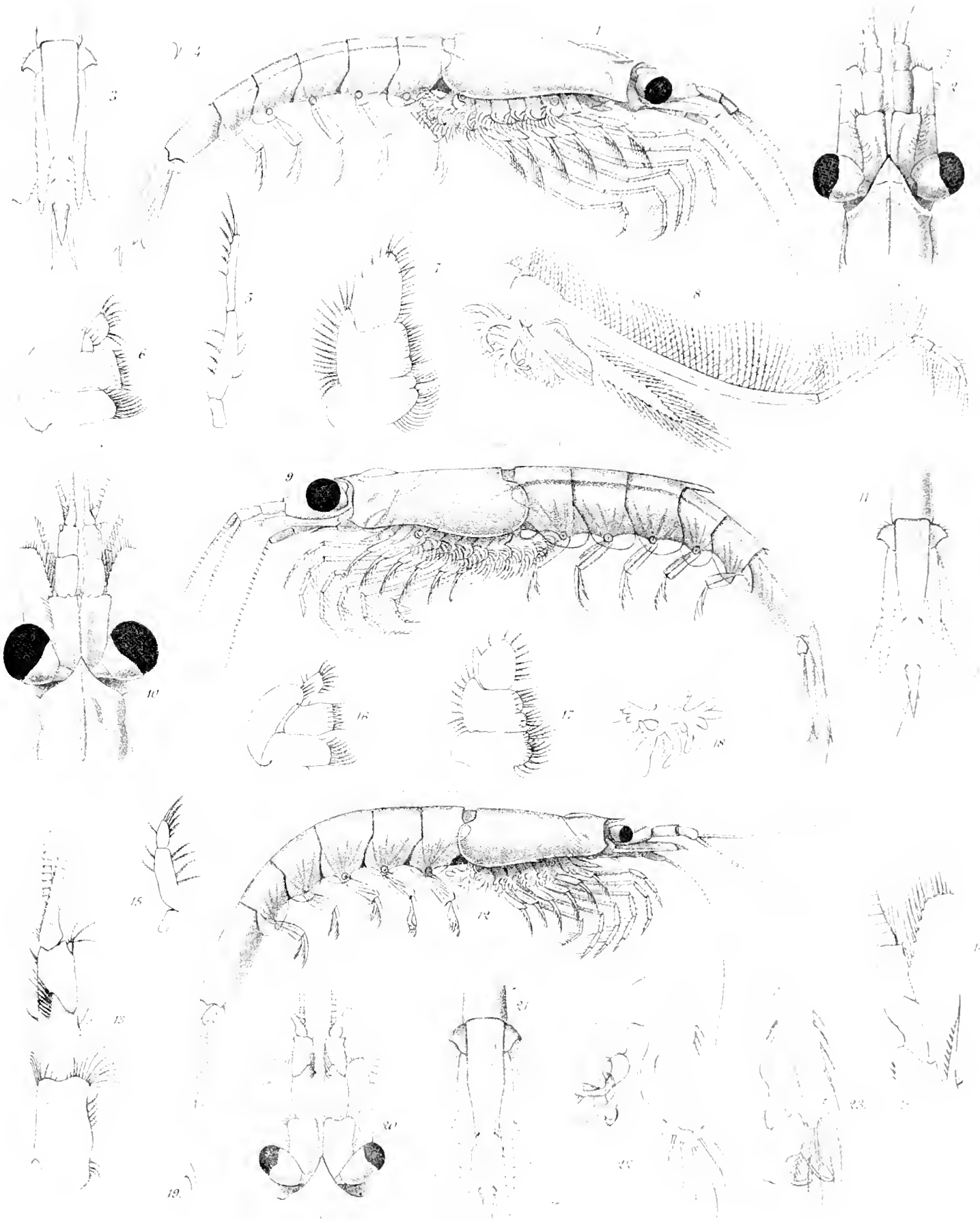
Fig. 1. Female, from right side; magnified about eight times.
Fig. 2. Anterior part of body, from above.
Fig. 3. Extremity of tail, with caudal fan, from above.
Fig. 4. Preanal spine.
Fig. 5. Mandibular palp.
Fig. 6. Maxilla of first pair.
Fig. 7. Maxilla of second pair.
Fig. 8. Leg of antepenultimate pair, with attached gill.

Figs. 9–11. *Euphausia mucronata*, G. O. Sars.

Fig. 9. Adult female, from left side; magnified about ten times.
Fig. 10. Anterior part of body, from above.
Fig. 11. Extremity of tail, with caudal fan, from above.

Figs. 12–23. *Euphausia gracilis*, Dana.

Fig. 12. Adult male, from right side; magnified about twelve times.
Fig. 13. Right antennular peduncle, from above.
Fig. 14. Left antenna, from below.
Fig. 15. Mandibular palp.
Fig. 16. Maxilla of first pair.
Fig. 17. Maxilla of second pair.
Fig. 18. Gill of last pair.
Fig. 19. Preanal spine.
Fig. 20. Anterior part of body, from above.
Fig. 21. Extremity of tail, with caudal fan, from above.
Fig. 22. Inner plate of a male pleopod of first pair.
Fig. 23. Inner plate of a male pleopod of second pair.



Figs 1–8, EUPHAUSIA ANTARCTICA, n sp Figs 9–11 EUPHAUSIA MUCRONATA, n sp
Figs 12–23, EUPHAUSIA GRACILIS, Dana

PLATE XVI.

PLATE XVI.

Figs. 1–8. *Euphausia gibba*, G. O. Sars.

Fig. 1. Adult male, from left side; magnified about ten times.

Fig. 2. Anterior part of body, from above.

Fig. 3. Extremity of tail, with caudal fan, from above.

Fig. 4. Rudimentary dorsal lobe of antennular peduncle; highly magnified.

Fig. 5. Left antenna, from below.

Fig. 6. Inner plate of a male pleopod of first pair.

Fig. 7. Inner plate of a male pleopod of second pair.

Fig. 8. Gill of last pair.

Figs. 9–16. *Euphausia spinifera*, G. O. Sars.

Fig. 9. Adult male, from right side; magnified about six times.

Fig. 10. Anterior part of body, from above.

Fig. 11. Extremity of tail, with caudal fan, from above.

Fig. 12. Dorsal lobe springing from basal joint of antennulæ; highly magnified.

Fig. 13. Spine-like dorsal lobe from second joint of antennulæ.

Fig. 14. Inner plate of a male pleopod of first pair.

Fig. 15. Inner plate of a male pleopod of second pair.

Fig. 16. Preanal spine.

Figs. 17–23. *Euphausia latifrons*, G. O. Sars.

Fig. 17. Male, from right side; magnified about twenty times.

Fig. 18. Anterior part of body, from above.

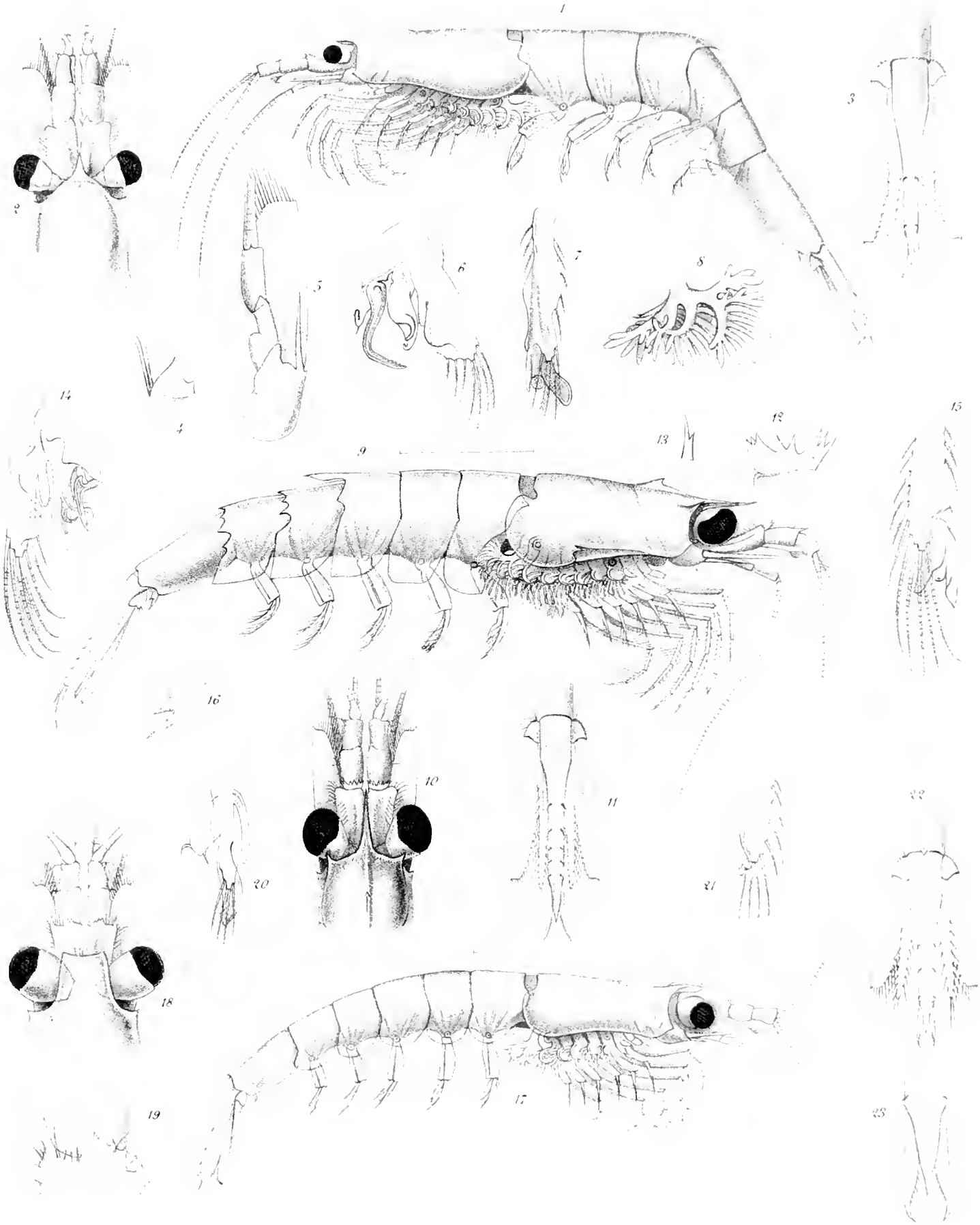
Fig. 19. Middle part of left antennular peduncle, from above, showing the dorsal lobe and the spine issuing from outer corner of basal joint.

Fig. 20. Inner plate of a male pleopod of first pair.

Fig. 21. Inner plate of a male pleopod of second pair.

Fig. 22. Extremity of tail, with caudal fan, from above.

Fig. 23. Tip of telson; more highly magnified.



Figs 1_8, EUPHAUSIA GIBBA, n sp Figs 9_16, EUPHAUSIA SPINIFERA, n sp
Figs 17_23, EUPHAUSIA LATIFRONS, n sp

PLATE XVII.

PLATE XVII.

Thysanopoda tricuspidata, Milne-Edwards.

Fig. 1. Adult female, from left side; magnified about six times.

Fig. 2. Anterior part of body, from above.

Fig. 3. Extremity of tail, with caudal fan, from above.

Fig. 3*a*. Tip of terminal projection of telson; highly magnified.

Fig. 4. Preanal spine.

Fig. 5. Left antennular peduncle of a younger specimen, from above.

Fig. 6. Right antenna, from below.

Fig. 7. Anterior lip.

Fig. 8. Posterior lip.

Fig. 9. Mandible, with palp.

Fig. 10. Maxilla of first pair.

Fig. 11. Maxilla of second pair.

Fig. 12. Maxilliped.

Fig. 12*a*. Terminal joint of same; more highly magnified.

Fig. 13. Leg of first pair, with attached gill and luminous organ.

Fig. 13*a*. Terminal joint of same; more highly magnified.

Fig. 14. Leg of second pair, with attached gill.

Fig. 15. Leg of fifth pair, with attached gill.

Fig. 16. Leg of penultimate pair, with gill and luminous organ.

Fig. 17. Gill of posterior pair.

Fig. 17*a*. Rudiment of leg of last pair.

Fig. 19. Epipodite of maxilliped.

Fig. 20. Gill of first pair.

Fig. 21. Gill of second pair.

Fig. 22. Gill of third pair.

Fig. 23. Gill of fourth pair.

Fig. 24. Gill of fifth pair.

Fig. 25. Gill of sixth, or penultimate pair.

THYSANOPODA TRICUSPIDATA M-Edw.

PLATE XVIII.

PLATE XVIII.

Figs. 1–14. *Thysanopoda obtusifrons*,[1] G. O. Sars.

Fig. 1. Female, from left side; magnified about six times.

Fig. 2. Anterior part of body, from above.

Fig. 3. Extremity of tail, with caudal fan, from above.

Fig. 4. Left antennular peduncle, from inner side.

Fig. 5. Left antenna, with scale and proximal part of flagellum, from below.

Fig. 6. Mandibular palp.

Fig. 7. Maxilla of first pair.

Fig. 8. Maxilla of second pair.

Fig. 9. Terminal joint of a leg of first pair.

Fig. 10. One of the anterior gills.

Fig. 11. Leg of penultimate pair, with attached gill.

Fig. 12. Gill of posterior pair, with rudiment of leg.

Fig. 13. Inner plate of a male pleopod of first pair.

Fig. 14. Inner plate of a male pleopod of second pair.

Figs. 15–20. *Thysanopoda cristata*, G. O. Sars.

Fig. 15. Adult male, from right side; magnified about three times.

Fig. 16. Anterior part of body, from above.

Fig. 17. Extremity of tail, with caudal fan, from above.

Fig. 18. Tip of telson; more highly magnified.

Fig. 19. Inner plate of a male pleopod of first pair.

Fig. 20. Inner plate of a male pleopod of second pair.

[1] *Thysanopoda obtusirostris* has been put in the plate by mistake.

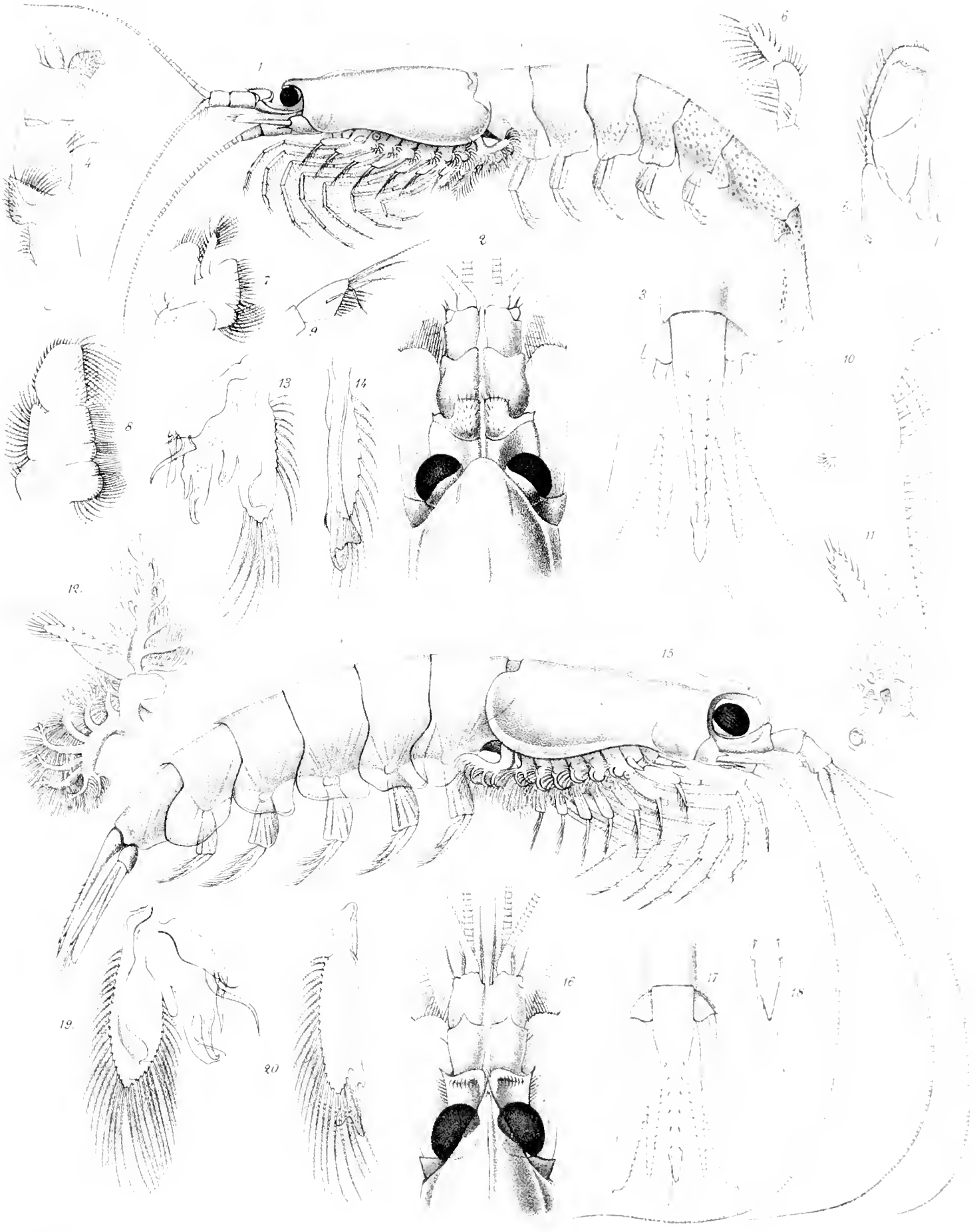


Fig. 1-14, THYSANOPODA OBTUSIROSTRIS, n. sp.
" 15-20 CRISTATA, n. sp.

PLATE XIX.

PLATE XIX.

Bentheuphausia amblyops, G. O. Sars.

Fig. 1. Young female, from right side; magnified about eight times. The legs were broken off in the specimen.

Fig. 2. Anterior part of body, from above.

Fig. 3. Extremity of tail, with caudal fan, from above.

Fig. 4. Right eye, from above.

Fig. 5. Left antennular peduncle, from above.

Fig. 6. Same, from inner side.

Fig. 7. Right antenna, with scale and proximal part of flagellum, from below.

Fig. 8. Anterior lip.

Fig. 9. Posterior lip.

Fig. 10. Mandibles, from below. The masticatory part only is represented on right side.

Fig. 11. Left mandible, from outer face.

Fig. 12. Maxilla of first pair.

Fig. 13. Maxilla of second pair.

Fig. 14. Maxilliped.

Fig. 15. Masticatory lobe of same.

Fig. 16. Basal part of a leg of first pair, with attached gill.

Fig. 17. Basal part of a leg of fifth pair, with gill.

Fig. 18. Last pair of legs, with attached gills.

Fig. 19. Gill of first pair.

Fig. 20. Gill of second pair.

Fig. 21. Gill of third pair. Tip of inner branch broken off.

Fig. 22. Gill of fifth pair.

Fig. 23. Gill of sixth pair.

Fig. 24. Gill of last pair.

Fig. 25. A pleopod.

BENTHEUPHAUSIA AMBLYOPS n.gen. & sp.

PLATE XX.

PLATE XX.

Nyctiphanes australis, G. O. Sars.

Fig. 1. Ovigerous female, from left side; magnified about eight times.

Fig. 2. Anterior division of body, together with first caudal segment of same, viewed from the ventral face, to show the form of the double ovisac.

Fig. 3. Anterior part of body, from above.

Fig. 4. Right antennular peduncle, from above.

Fig. 5. Same, from inner side.

Fig. 6. Basal joint of same, from outer side.

Fig. 7. Right antenna, with scale and proximal part of flagellum, from below.

Fig. 8. Anterior lip.

Fig. 9. Posterior lip.

Fig. 10. Mandible, with palp.

Fig. 11. Cutting edges of mandibles.

Fig. 12. Maxilla of first pair.

Fig. 13. Maxilla of second pair.

Fig. 14. Maxilliped.

Fig. 14*a*. Terminal joint of same; more highly magnified.

Fig. 15. Leg of first pair, with gill and luminous organ.

Fig. 15*a*. Terminal joint of same; more highly magnified.

Fig. 16. Leg of second pair, with attached gill.

Fig. 17. Leg of fifth pair, with gill (exopod wanting).

Fig. 18. Leg of penultimate pair, with gill and luminous organ (exopod wanting).

Fig. 19. Gill of last pair, with rudiment of leg.

Fig. 20. Rudimentary leg of last pair, isolated, and more highly magnified.

Fig. 21. A pleopod.

Fig. 22. Extremity of tail, with caudal fan, from above.

Fig. 23. Tip of telson; more highly magnified.

NYCTIPHANES AUSTRALIS n. gen. & sp.

PLATE XXI.

PLATE XXI.

Figs. 1–7. *Nyctiphanes australis*, G. O. Sars.

(*Continued.*)

Fig. 1. Adult male, from right side; magnified about eight times.

Fig. 2. Anterior part of body of same, from above.

Fig. 3. Posterior part of trunk, together with a part of first caudal segment, from above, exhibiting the peculiar form of the posterior emargination of the carapace.

Fig. 4. Left male antenna, with scale and proximal part of flagellum, from below.

Fig. 5. Leg of penultimate pair in male, with exopod and gill.

Fig. 6. Inner plate of a male pleopod of first pair.

Fig. 7. Inner plate of a male pleopod of second pair.

Figs. 8–17. *Thysanoëssa gregaria*, G. O. Sars.

Fig. 8. Adult female, from left side; magnified about seven times.

Fig. 9. Same, from above.

Fig. 10. Right eye, from anterior side.

Fig. 11. Same, from posterior side.

Fig. 12. Anterior part of body, from above.

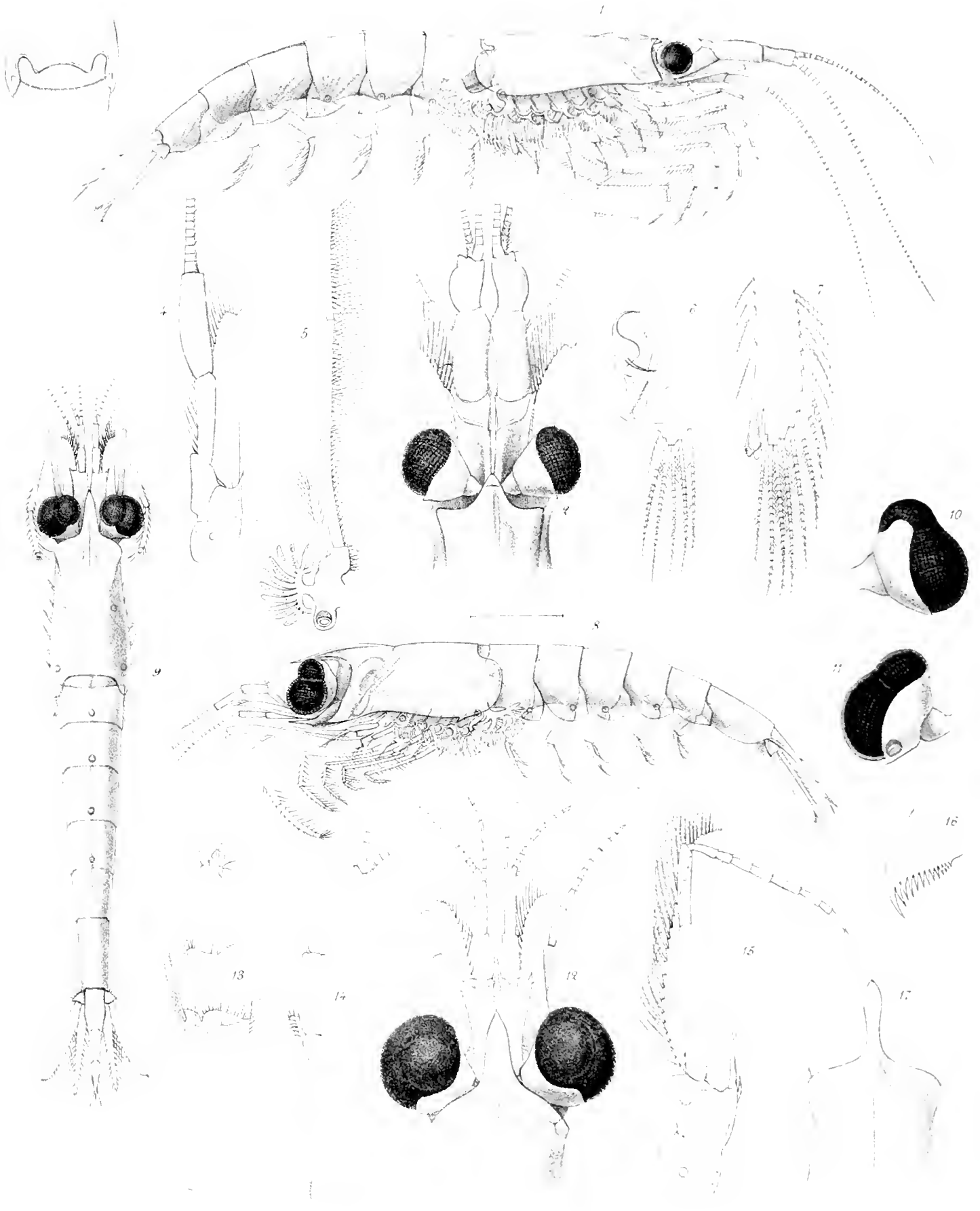
Fig. 13. Right antennular peduncle, from above.

Fig. 14. Same, from inner side.

Fig. 15. Left antenna, from below.

Fig. 16. Preanal spine.

Fig. 17. Anterior part of carapace of a male specimen, from above, showing the deviating form of the rostral projection.



Figs 1-7, NYCTIPHANES AUSTRALIS, n sp ♂
Figs 8-17, THYSANOESSA GREGARIA, n sp

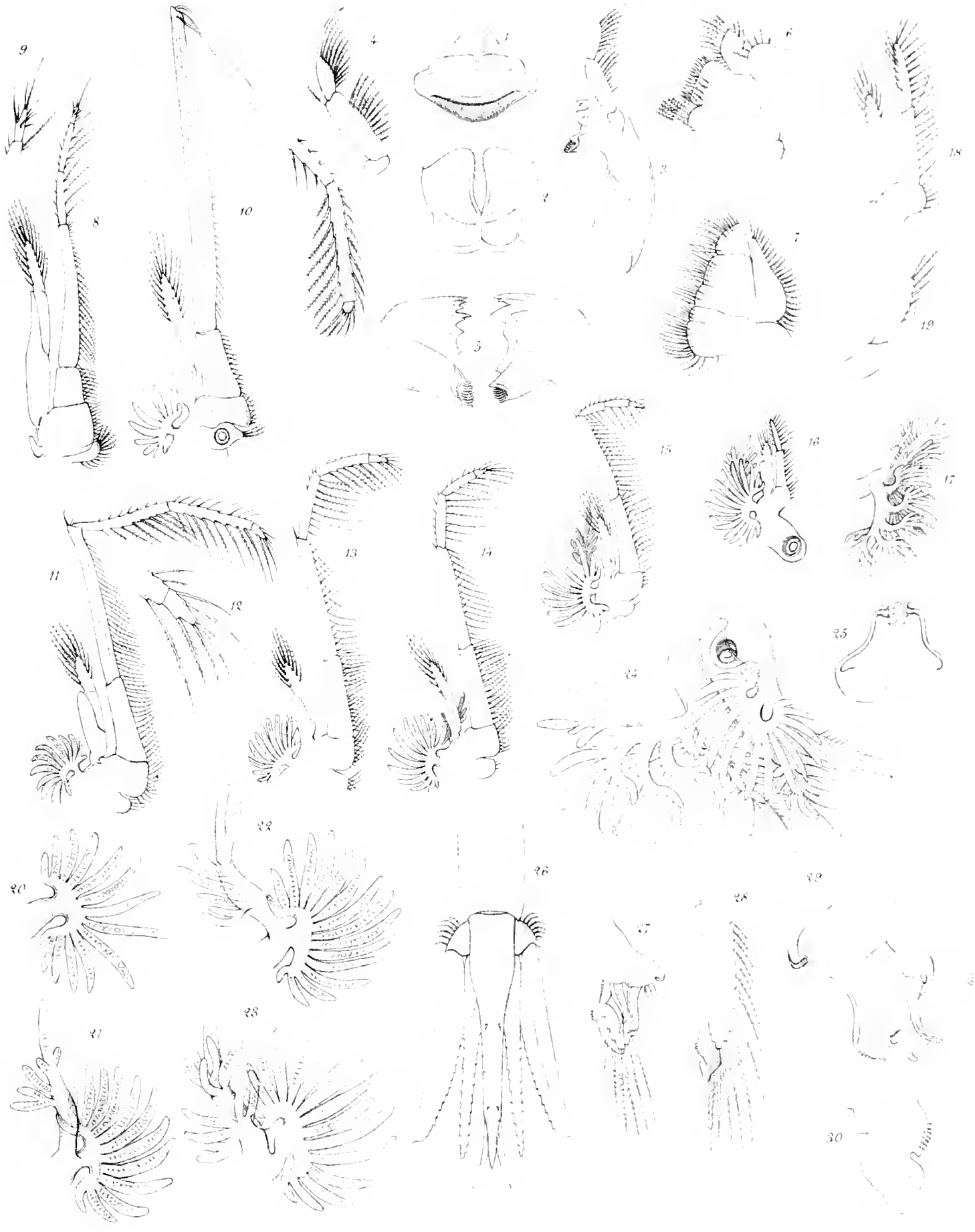
PLATE XXII.

PLATE XXII.

Thysanoëssa gregaria, G. O. Sars.

(Anatomy—*continued*).

Fig. 1. Anterior lip.
Fig. 2. Posterior lip.
Fig. 3. Mandible.
Fig. 4. Mandibular palp.
Fig. 5. Masticatory parts of mandibles, exhibiting the armature of the cutting edges.
Fig. 6. Maxilla of first pair.
Fig. 7. Maxilla of second pair.
Fig. 8. Maxilliped.
Fig. 9. Terminal joint of same; more highly magnified.
Fig. 10. Leg of first pair, with gill and luminous organ.
Fig. 11. Leg of second pair, with attached gill.
Fig. 12. Extremity of same; more highly magnified.
Fig. 13. Leg of third pair, with gill.
Fig. 14. Leg of fourth pair, with gill.
Fig. 15. Leg of fifth pair, with gill.
Fig. 16. Leg of penultimate pair, with gill and luminous organ.
Fig. 17. Gill of last pair, with rudiment of leg.
Fig. 18. Leg of penultimate pair, without gill and luminous organ; more highly magnified.
Fig. 19. Rudimentary leg of last pair.
Fig. 20. Gill of second pair.
Fig. 21. Gill of third pair.
Fig. 22. Gill of fourth pair.
Fig. 23. Gill of fifth pair.
Fig. 24. Gills of the two posterior pairs, on right side, *in situ*, from outer face.
Fig. 25. Spermatophores affixed to the genital openings of a female specimen.
Fig. 26. Extremity of tail, with caudal fan, from above.
Fig. 27. Inner plate of a male pleopod of first pair.
Fig. 28. Inner plate of a male pleopod of second pair.
Fig. 29. Copulatory appendage to first pleopod, isolated, and more highly magnified.
Fig. 30. Tip of copulatory appendage to second pleopod.



PHYSANOESSA GREGARIA, n. sp.
Anatomy

PLATE XXIII.

PLATE XXIII.

Figs. 1–4. *Thysanoëssa macrura*, G. O. Sars.

Fig. 1. Female, from left side; magnified about ten times.

Fig. 2. Anterior part of body, from above.

Fig. 3. Extremity of tail, with caudal fan, from above.

Fig. 4. Preanal spine.

Figs. 5–10. *Nematoscelis megalops*, G. O. Sars.

Fig. 5. Adult female, from right side; magnified about six times.

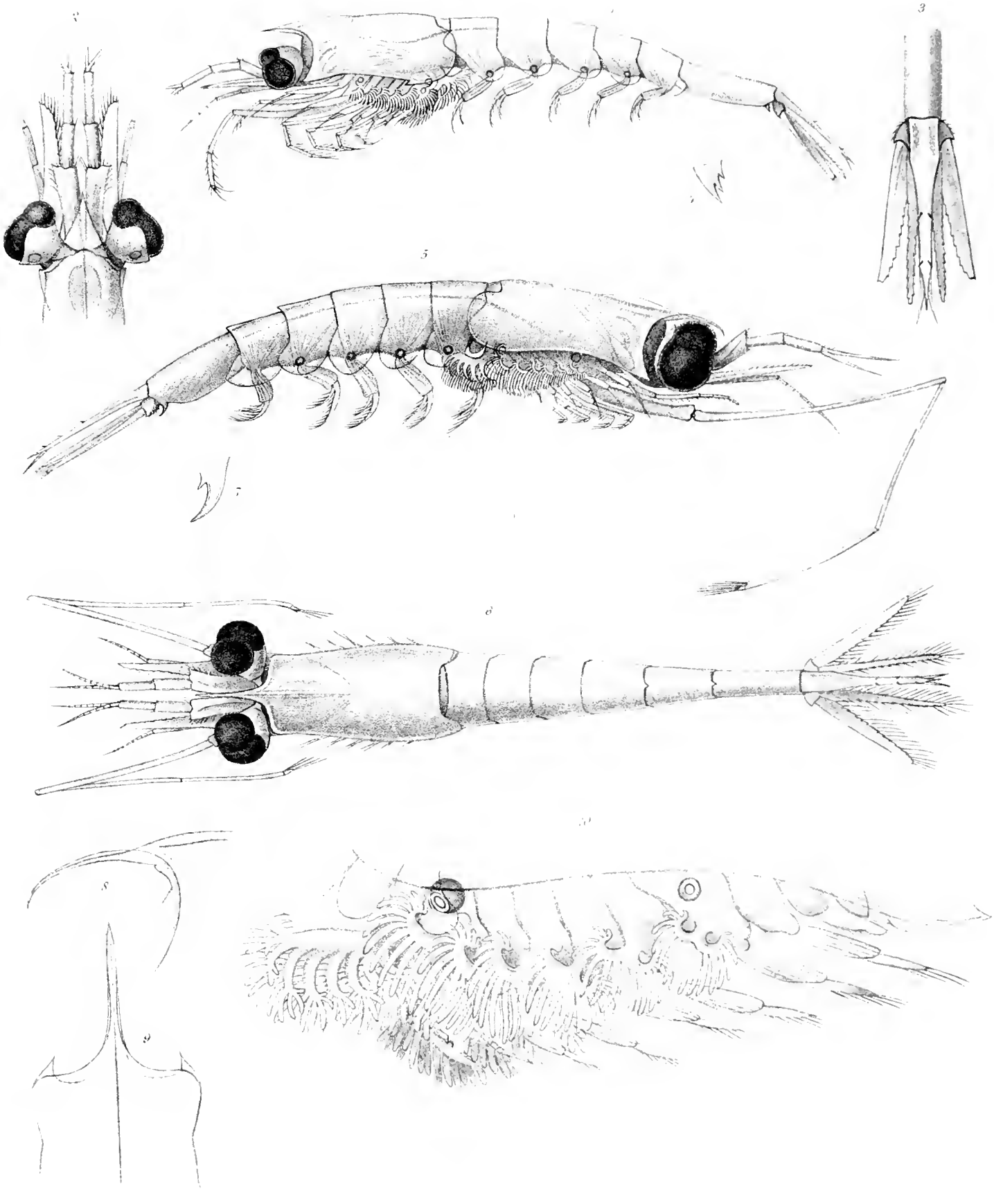
Fig. 6. Same, from above.

Fig. 7. Preanal spine.

Fig. 8. Anterior part of carapace, with the narrow rostral projection, from left side.

Fig. 9. Same, from above.

Fig. 10. Right side of trunk, with gills in their natural position.



Figs 1–4 THYSANOESSA MACRURA, n sp
„ 5–10 NEMATOSCELIS MEGALOPS, n gen & sp

PLATE XXIV.

PLATE XXIV.

Nematoscelis megalops, G. O. Sars.

(Anatomy—*continued.*)

Fig. 1. Anterior part of body, with eyes, antennulæ, antennæ, anterior lip, and mandibles, from below.

Fig. 2. Left antennular peduncle, from above.

Fig. 3. Left antenna, from below.

Fig. 4. Anterior lip.

Fig. 5. Posterior lip.

Fig. 6. Mandible, with palp.

Fig. 7. Masticatory parts of mandibles, exhibiting the armature of the cutting edges.

Fig. 8. Mandibular palp.

Fig. 9. Maxilla of first pair.

Fig. 10. Maxilla of second pair.

Fig. 11. Maxilliped.

Fig. 12. Terminal joint of same; more highly magnified.

Fig. 13. Leg of first pair.

Fig. 14. Extremity of same; more highly magnified.

Fig. 15. Outer part of a terminal spine; highly magnified.

Fig. 16. Leg of second pair.

Fig. 17. Extremity of same: more highly magnified.

Fig. 18. Leg of third pair.

Fig. 19. Leg of fourth pair.

Fig. 20. Leg of fifth pair.

Fig. 21. Leg of penultimate pair.

Fig. 22. Same, without the gill and luminous organ; more highly magnified.

Fig. 23. Rudimentary leg of last pair.

Fig. 24. Gill of second pair.

Fig. 25. Gill of third pair.

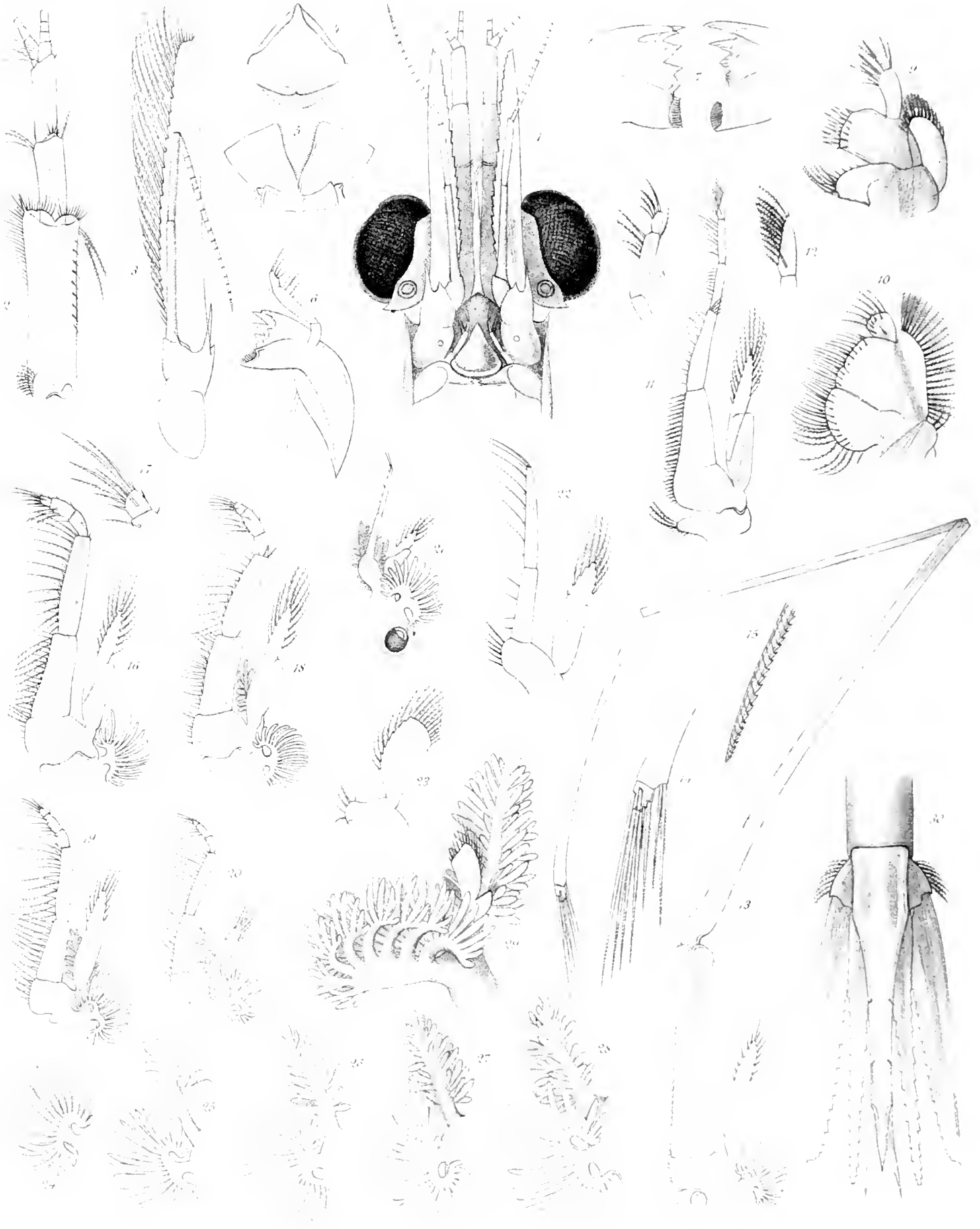
Fig. 26. Gill of fourth pair.

Fig. 27. Gill of fifth pair.

Fig. 28. Gill of penultimate pair.

Fig. 29. Gill of last pair, with rudiment of leg.

Fig. 30. Extremity of tail, with caudal fan, from above.



NEMATOSCELIS MEGALOPS n gen & sp

Anat

PLATE XXV.

PLATE XXV.

Figs. 1–4. *Nematoscelis microps*, G. O. Sars.

Fig. 1. Ovigerous female, from right side; magnified about nine times.

Fig. 2. Anterior part of body, from above.

Fig. 3. Extremity of a leg of first pair.

Fig. 4. Extremity of tail, with caudal fan, from above.

Figs. 5–7. *Nematoscelis tenella*, G. O. Sars.

Fig. 5. Female, from left side; magnified about fourteen times.

Fig. 6. Anterior part of body, from above.

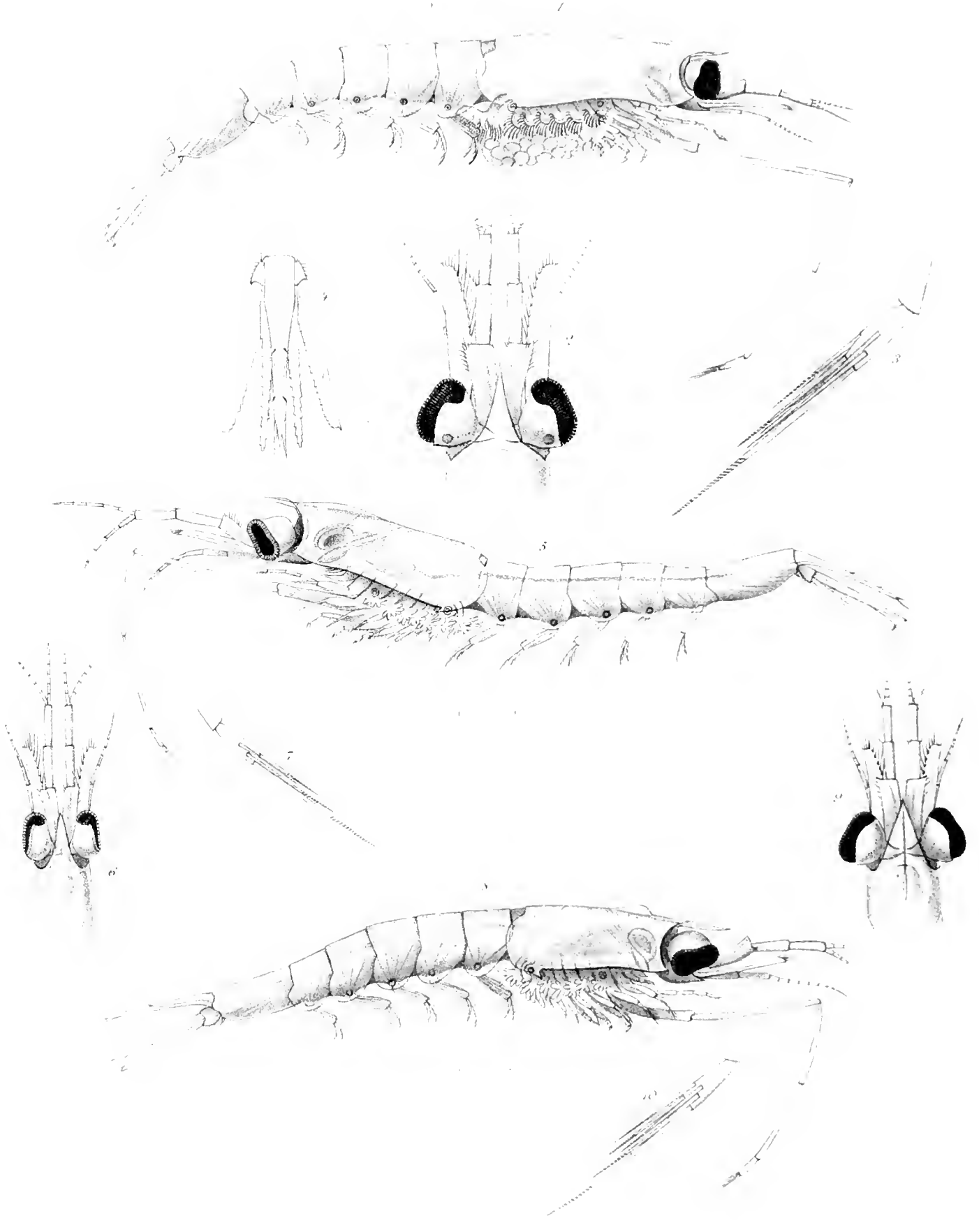
Fig. 7. Extremity of a leg of first pair.

Figs. 8–10. *Nematoscelis rostrata*, G. O. Sars.

Fig. 8. Female, from right side; magnified about fourteen times.

Fig. 9. Anterior part of body, from above.

Fig. 10. Extremity of a leg of first pair.



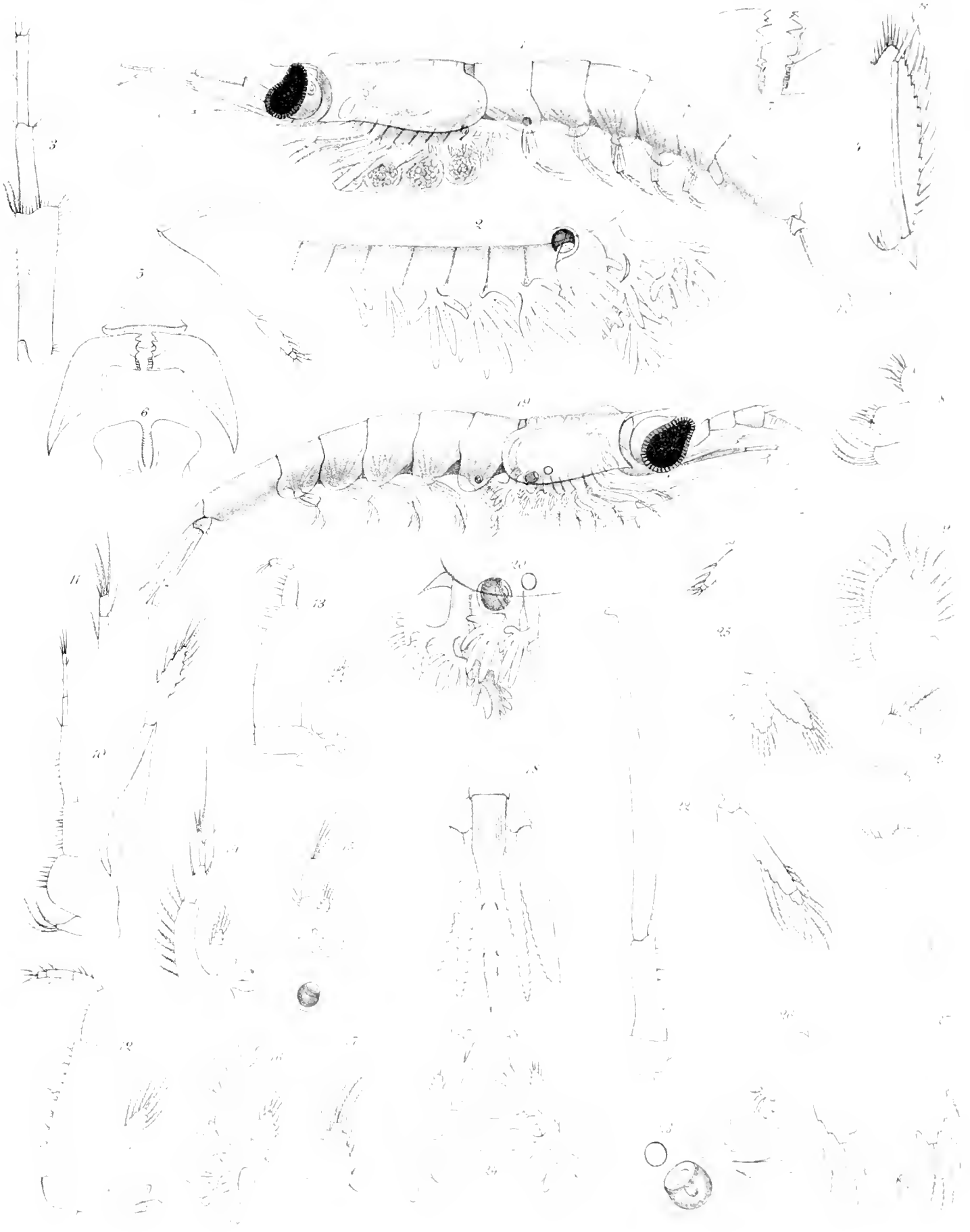
Figs 1–4, NEMATOSCELIS MICROPS, n sp Figs 5–7, NEMATOSCELIS TENELLA, n sp
Figs 8–10, NEMATOSCELIS ROSTRATA n sp

PLATE XXVI.

PLATE XXVI.

Stylocheiron carinatum, G. O. Sars.

Fig. 1. Ovigerous female, from left side; magnified about fourteen times.
Fig. 2. Left side of trunk, with the gills *in situ*, from outer face.
Fig. 3. Right antennular peduncle, from above.
Fig. 4. Right antenna, with scale and proximal part of flagellum, from below.
Fig. 5. Anterior lip and mandibles.
Fig. 6. Posterior lip.
Fig. 7. Masticatory parts of mandibles, exhibiting the armature of the cutting edges.
Fig. 8. Maxilla of first pair.
Fig. 9. Maxilla of second pair.
Fig. 10. Maxilliped.
Fig. 11. Extremity of same; more highly magnified.
Fig. 12. Leg of third pair.
Fig. 13. Leg of fourth pair.
Fig. 14. Leg of fifth pair.
Fig. 15. Leg of penultimate pair, with luminous organ.
Fig. 16. Gill of last pair, with rudiment of leg.
Fig. 17. Rudimentary leg of last pair, isolated, and more highly magnified.
Fig. 18. Extremity of tail, with caudal fan, from above.
Fig. 19. Adult male, from right side.
Fig. 20. The four posterior gills on right side of same, with the greatly developed luminous organ at base of penultimate pair.
Fig. 21. Right male antennular peduncle, from above.
Fig. 22. Leg of second pair (exopod and gill omitted).
Fig. 23. Gill of penultimate pair in male, with the luminous organ.
Fig. 24. Last pair of gills, from below.
Fig. 25. Male pleopod of first pair.
Fig. 26. Inner plate of same; more highly magnified.
Fig. 27. Inner plate of a male pleopod of second pair.



STYLOCHEIRON CARINATUM n.gen.& sp.

PLATE XXVII.

PLATE XXVII.

Figs. 1–4. *Stylocheiron suhmii*, G. O. Sars.

Fig. 1. Female, from right side; magnified about eighteen times.

Fig. 2. Antennal scale.

Fig. 3. Extremity of a leg of second pair.

Fig. 4. Anterior part of body of a male specimen, from above.

Fig. 5. *Stylocheiron longicorne*, G. O. Sars.

Fig. 5. Female, from right side; magnified about eighteen times.

Figs. 6–10. *Stylocheiron elongatum*, G. O. Sars.

Fig. 6. Adult male, from right side; magnified about twelve times.

Fig. 7. Antennal scale.

Fig. 8. Extremity of a leg of second pair.

Fig. 9. Inner plate of a male pleopod of first pair.

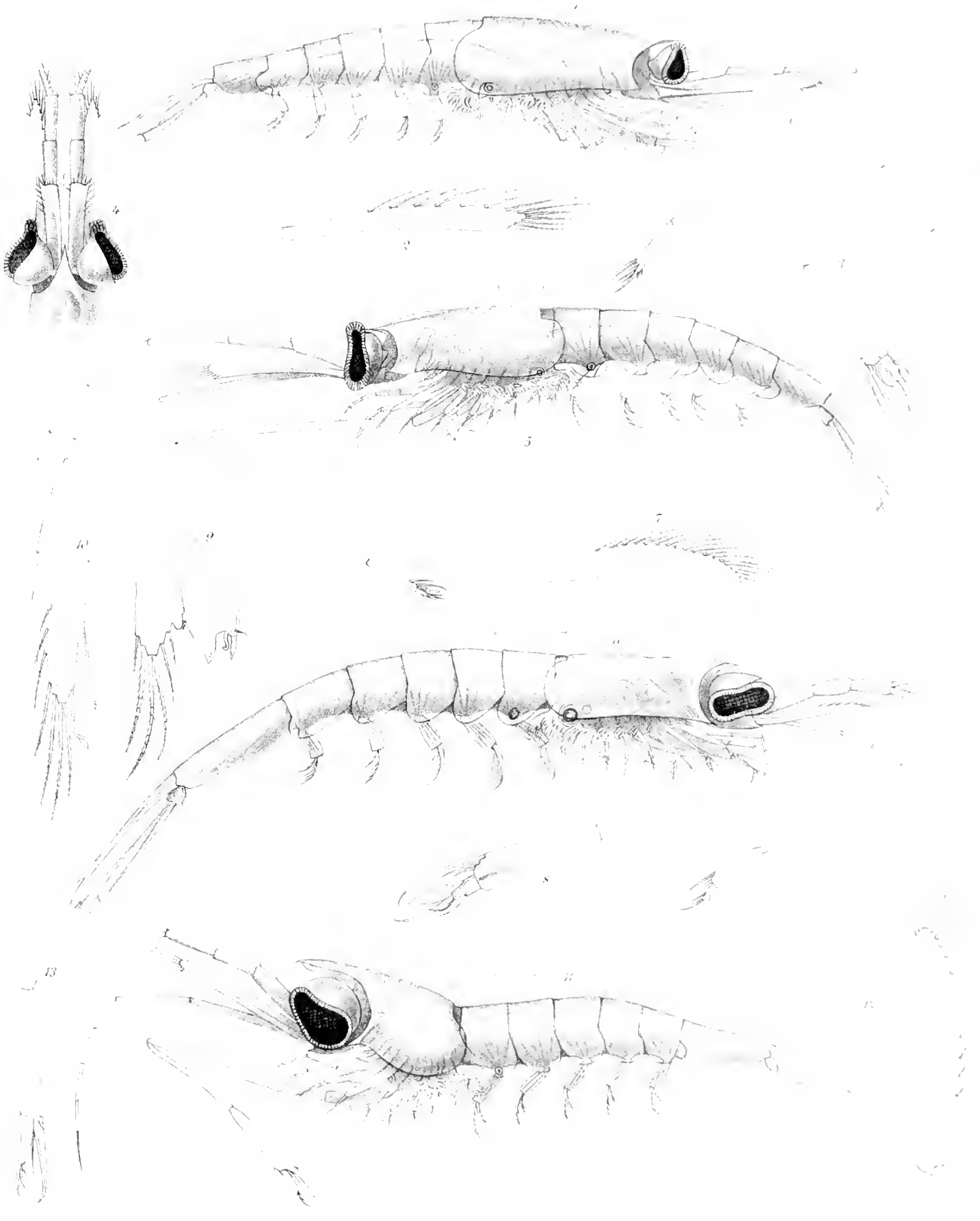
Fig. 10. Inner plate of a male pleopod of second pair.

Figs. 11–13. *Stylocheiron abbreviatum*, G. O. Sars.

Fig. 11. Female, from left side; magnified about eighteen times.

Fig. 12. Right antenna, with scale and proximal part of flagellum, from below

Fig. 13. Extremity of a leg of second pair, forming a complete chela.



Figs 1–4, STYLOCHEIRON SUHMII, n. sp. — Fig. 5, STYLOCHEIRON LONGICORNE n. sp.
„ 6–10 „ ELONGATUM, n. sp. — 11–13 „ ABBREVIATUM n. sp.

PLATE XXVIII.

PLATE XXVIII.

Nyctiphanes australis, G. O. Sars.

(Early larval stages.)

Fig. 1. Larva in Metanauplius stage, from above; highly magnified.

Fig. 2. Same, from left side.

Fig. 3. Same, from below, more strongly magnified, exhibiting the budding limbs behind the anterior lip.

Fig. 4. Larva in first Calyptopis stage, from right side; highly magnified.

Fig. 5. Same, from above.

Fig. 6. Same, from below; more strongly magnified.

Fig. 7. Anterior prominence of ocular segment, with the ocellus.

Fig. 8. One of the antennulæ.

Fig. 9. One of the antennæ.

Fig. 10. Anterior lip and mandibles.

Fig. 11. Posterior lip.

Fig. 12. Mandible.

Fig. 13. Cutting edge of left mandible.

Fig. 14. Cutting edge of right mandible.

Fig. 15. Appendicular plate of cutting edge.

Fig. 16. Maxilla of first pair.

Fig. 17. Maxilla of second pair.

Fig. 18. Maxilliped.

Fig. 19. Extremity of tail, from below.

Fig. 20. Larva in second Calyptopis stage, from left side; highly magnified.

Fig. 21. One of the antennulæ.

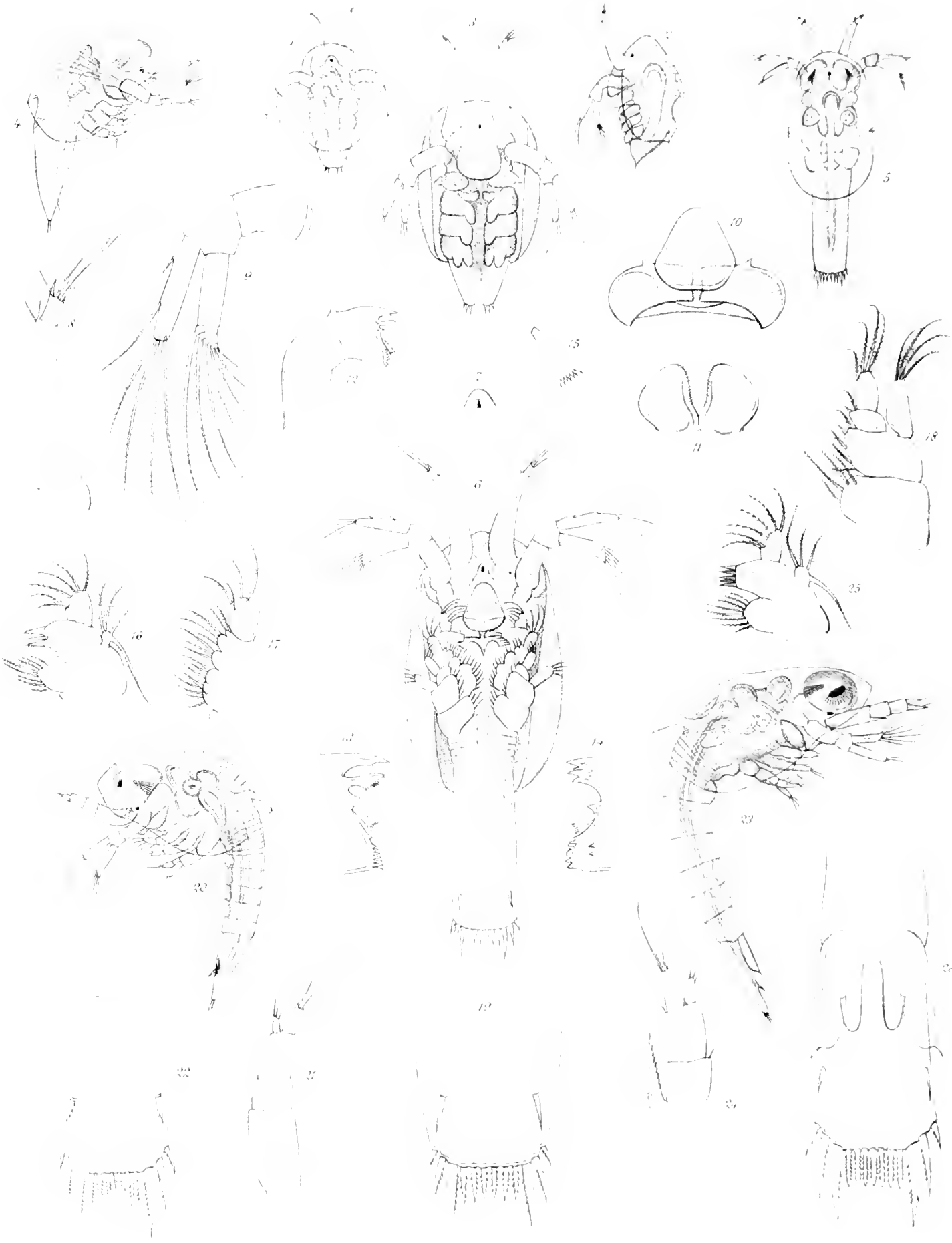
Fig. 22. Extremity of tail, from below.

Fig. 23. Larva in last Calyptopis stage, from right side; highly magnified.

Fig. 24. Left antennulæ, from above.

Fig. 25. Maxilla of first pair.

Fig. 26. Extremity of tail, with telson and uropoda, from below.



NYCTIPHANES AUSTRALIS, n. sp.
(Early larval stages.)

PLATE XXIX.

PLATE XXIX.

Euphausia pellucida, Dana.

(Development.)

Fig. 1. Larva in second Calyptopis stage, from left side; highly magnified.

Fig. 2. Same, from above.

Fig. 3. Larva in last Calyptopis stage, from left side.

Fig. 4. Larva in first Furcilia stage, from right side.

Fig. 5. Same, from above.

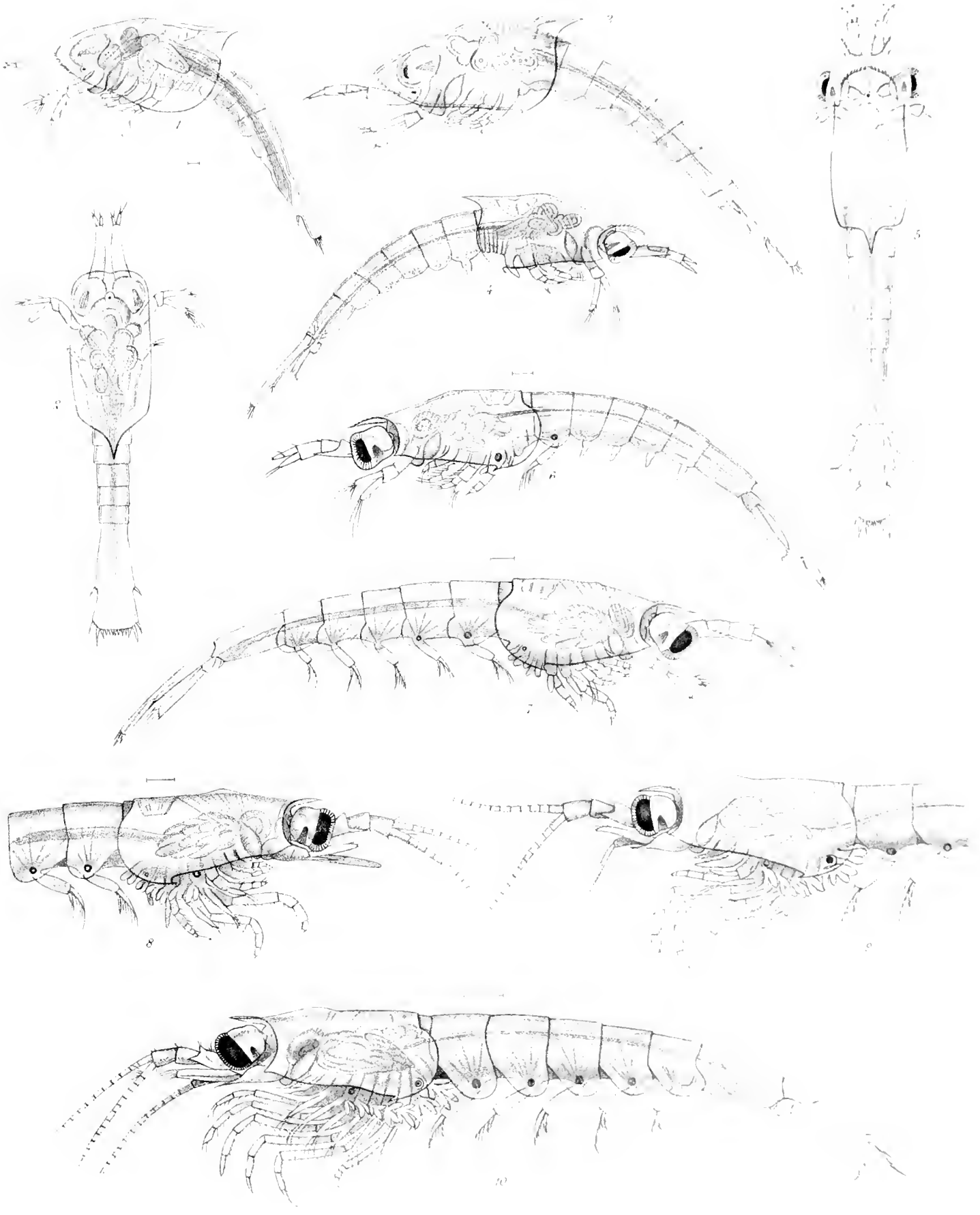
Fig. 6. Larva in an intermediate Furcilia stage, from left side.

Fig. 7. Larva in last Furcilia stage, from right side.

Fig. 8. Anterior part of a larva in first Cyrtopia stage, from right side.

Fig. 9. Anterior part of a larva in a later Cyrtopia stage, from left side.

Fig. 10. Young *Euphausia*, with all its limbs developed, from left side; magnified about twenty times.



EUPHAUSIA PELLUCIDA, Dana
Development

PLATE XXX.

PLATE XXX.

Euphausia pellucida. Dana.

(Development of the limbs.)

Fig. 1. Left antennula of a larva in second Calyptopis stage.
Fig. 2. Same part of a larva in last Calyptopis stage.
Fig. 3. Same part of a larva in last Furcilia stage.
Fig. 4. Same part of a larva in first Cyrtopia stage.
Fig. 5. Same part of a young *Euphausia*.
Fig. 6. Right antenna of a larva in last Furcilia stage, from below.
Fig. 7. Same part of a larva in first Cyrtopia stage.
Fig. 8. Same part of a young *Euphausia*.
Fig. 9. Ocular segment, with left eye, of a larva in second Furcilia stage, from below.
Fig. 10. Mandible of a larva in first Furcilia stage.
Fig. 11. Same part of a larva in last Cyrtopia stage.
Fig. 12. Same part of a young *Euphausia*.
Fig. 13. Maxilla of first pair of a larva in last Calyptopis stage
Fig. 14. Same part of a larva in last Cyrptopia stage.
Fig. 15. Same part of a young *Euphausia*.
Fig. 16. Maxilla of second pair of a larva in last Calyptopis stage
Fig. 17. Same part of a larva in last Cyrtopia stage.
Fig. 18. Same part of a young *Euphausia*.
Fig. 19. Maxilliped of a larva in last Calyptopis stage.
Fig. 20. Same part of a larva in first Cyrtopia stage.
Fig. 21. Same part of a larva in an intermediate Cyrtopia stage.
Fig. 22. Same part of a larva in last Cyrtopia stage.
Fig. 23. Leg of first pair of a larva in first Furcilia stage.
Fig. 24. Same part of a larva in an immediately following Furcilia stage.
Fig. 25. Same part of a larva in second Furcilia stage.
Fig. 26. Same part of a larva in last Furcilia stage.
Fig. 27. Same part of a larva in last Cyrtopia stage.
Fig. 28. Left side of trunk, with gills, of a larva in last Furcilia stage.
Fig. 29. Same part of a larva in first Cyrtopia stage.
Fig. 30. Leg of fourth pair, with rudiment of gill of same larva.
Fig. 31. Left side of trunk, with gills, of a larva in second Cyrtopia stage.
Fig. 32. Same part of a young *Euphausia*.
Fig. 33. Pleopod of first pair of a larva in first Furcilia stage.
Fig. 34. Same part of a larva in second Furcilia stage.
Fig. 35. Same part of a larva in last Furcilia stage.
Fig. 36. Extremity of tail of a larva in second Calyptopis stage, from below.
Fig. 37. Same part, with right uropod, of a larva in last Calyptopis stage.
Fig. 38. Same part of a larva in first Furcilia stage.
Fig. 39. Same part of a larva in second Furcilia stage.
Fig. 40. Same part of a larva in last Furcilia stage.
Fig. 41. Telson of a larva in first Cyrtopia stage.
Fig. 42. Extremity of tail, with telson and right uropod of a larva in last Cyrtopia stage.

EUPHAUSIA PELLUCIDA, Dana
(Development of the limbs)

PLATE XXXI.

PLATE XXXI.

Figs. 1–22. *Thysanopoda tricuspidata*, Milne-Edwards.

(Development.)

Fig. 1. Larva in second Calyptopis stage, from left side; highly magnified.
Fig. 2. Larva in last Calyptopis stage, from right side.
Fig. 3. Larva in first Furcilia stage, from left side.
Fig. 4. Same, from above.
Fig. 5. Larva in second Furcilia stage, from right side.
Fig. 6. Larva in second Cyrtopia stage, from left side.
Fig. 7. Eyes of a larva in last Calyptopis stage.
Fig. 8. Eye of a larva in second Furcilia stage.
Fig. 9. Same part of a larva in second Cyrtopia stage.
Fig. 10. Anterior part of body of a young *Thysanopoda*, from above.
Fig. 11. Same part, from left side.
Fig. 12. Tip of lateral protuberance of eye, with seven corneal lenses.
Fig. 13. Mandible of a larva in last Calyptopis stage.
Fig. 14. Maxilla of first pair of same.
Fig. 15. Maxilla of second pair of same.
Fig. 16. Maxilliped of same.
Fig. 17. Extremity of tail of same larva, with telson and right uropod, from above.
Fig. 18. Telson of a larva in first Furcilia stage.
Fig. 19. Extremity of telson of a larva in second Furcilia stage.
Fig. 20. Same part of a larva in first Cyrtopia stage.
Fig. 21. Same part of a larva in last Cyrtopia stage.
Fig. 22. Same part of a young *Thysanopoda*.

Figs. 23–29. *Nematoscelis rostrata*, G. O. Sars.

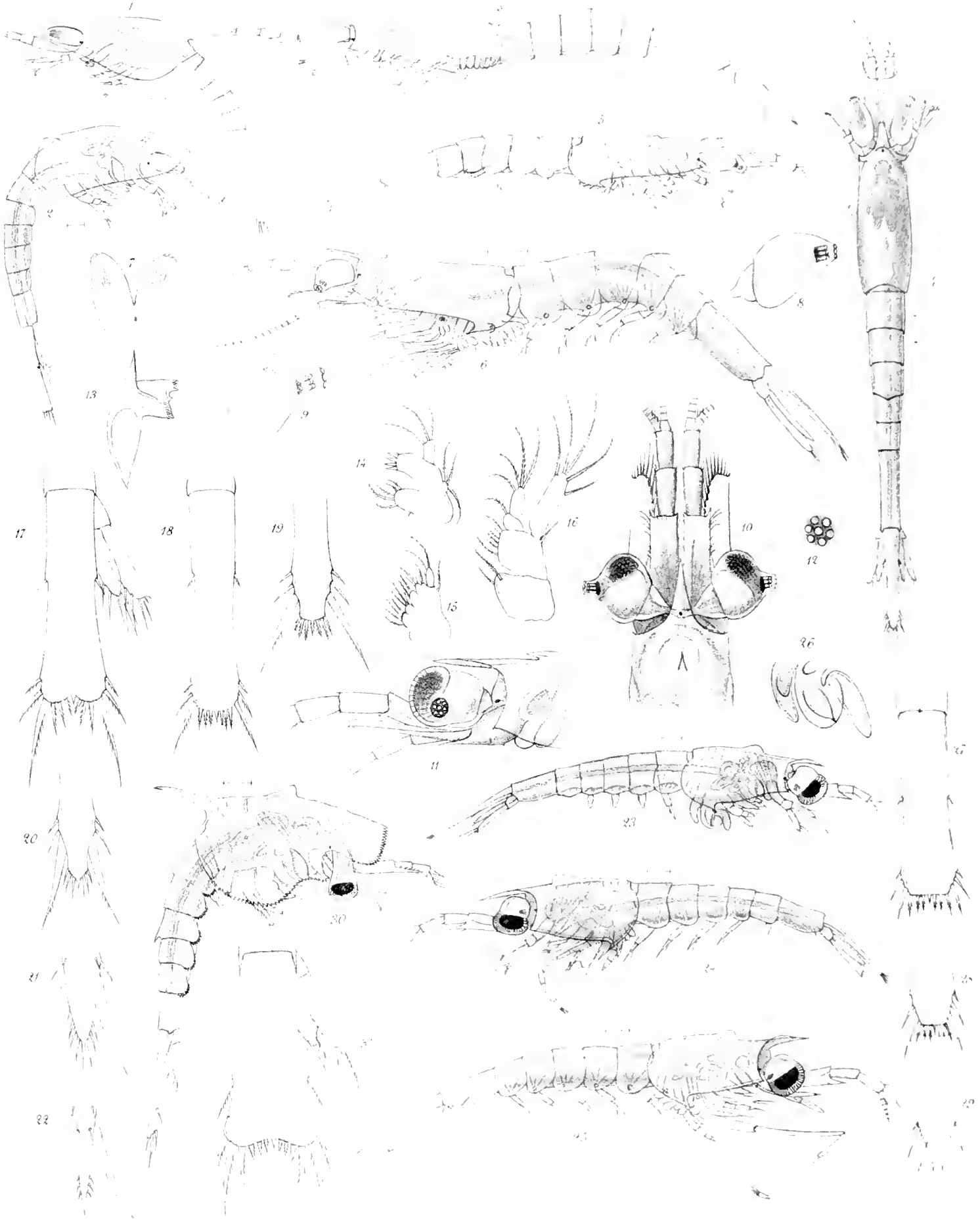
(Development.)

Fig. 23. Larva in Furcilia stage, from right side; highly magnified.
Fig. 24. Larva in a subsequent Furcilia stage, from left side.
Fig. 25. Larva in Cyrtopia stage, from right side; magnified about twenty-four times.
Fig. 26. Legs of first and second pairs of the larva represented in fig. 23, isolated, and more highly magnified.
Fig. 27. Telson of same larva, from above.
Fig. 28. Extremity of telson of the larva represented in fig. 24.
Fig. 29. Same part of a larva in Cyrtopia stage.

Figs. 30–31. *Euphausia* sp. (?).

(Larval stage.)

Fig. 30. Larva in first Furcilia stage, from right side; magnified about eighteen times.
Fig. 31. Extremity of tail of same larva, with telson and right uropod, from above.



Figs 1-22, THYSANOPODA TRICUSPIDATA, Edw
Figs 23-29, NEMATOSCELIS ROSTRATA, G O Sars Figs 30-31, EUPHAUSIA ? sp
(Development)

PLATE XXXII.

PLATE XXXII.

Figs. 1–9. *Petalophthalmus armiger*, Willemoes-Suhm.

Fig. 1. Adult male, from left side; magnified about four times.

Fig. 2. Anterior part of body, from above.

Fig. 3. One of the petaloid eyes.

Fig. 4. Right antenna, from outer side.

Fig. 5. Gnathopod.

Fig. 6. Maxilliped.

Fig. 7. A pleopod.

Fig. 8. Extremity of tail, with telson and right uropod, from above.

Fig. 9. Tip of telson; more highly magnified.

Figs. 10–20. *Boreomysis scyphops*, G. O. Sars.

Fig. 10. Adult female, from left side; very slightly magnified.

Fig. 11. Anterior division of body, together with first caudal segment, from left side; somewhat more magnified. The free parts of the carapace have been removed to show the segments of the trunk with their branchial folds; moreover, the gnathopods and legs are omitted, to show the seven incubatory lamellæ issuing from their bases.

Fig. 12. Anterior division of body, together with the two anterior caudal segments, from above. The dorsal body-wall, together with the viscera, have been removed to show the nervous cord.

Fig. 13. Left eye, from outer face.

Fig. 14. Mandible, with palp.

Fig. 15. Maxilla of first pair.

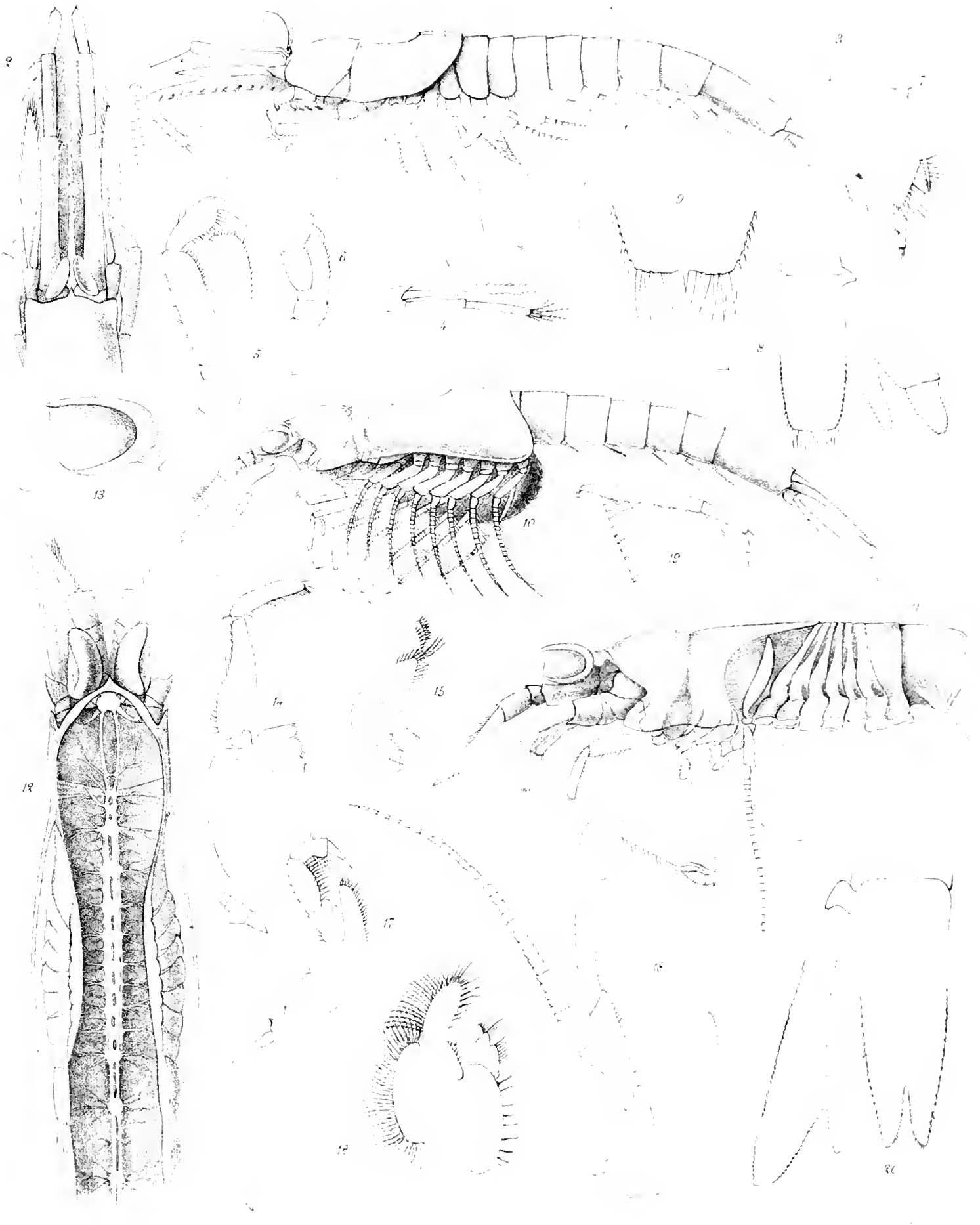
Fig. 16. Maxilla of second pair.

Fig. 17. Maxilliped; the terminal part of the exopodite is omitted.

Fig. 18. Gnathopod, with attached incubatory lamella.

Fig. 19. Outer part of a leg.

Fig. 20. Extremity of tail, with telson and left uropod, from above.



Figs 1-9 PETALOPHTHALMUS ARMIGER, Willem Sutm ♂
10-20 BOREOMYSIS SCYPHOPS G O Sars ♀

PLATE XXXIII.

PLATE XXXIII.

Figs. 1–6. *Boreomysis obtusata*, G. O. Sars.

Fig. 1. Adult male, from left side; magnified about five times.

Fig. 2. Carapace, with eyes, antennulæ and antennæ, from above.

Fig. 3. Frontal margin.

Fig. 4. Antennal scale.

Fig. 5. Outer part of a leg.

Fig. 6. Telson, from above.

Figs. 7–10. *Boreomysis microps*, G. O. Sars.

Fig. 7. Adult female, from above; magnified about six times.

Fig. 8. Anterior part of body, with eyes, right antennular peduncle, and right antenna, from above.

Fig. 9. Telson, from above.

Fig. 10. Extremity of same; more highly magnified.

Figs. 11–16. *Amblyops crozetii*, Willemoes-Suhm MS.

Fig. 11. Adult male, from above; magnified about five times.

Fig. 12. Same, from right side.

Fig. 13. Right antenna, with scale and proximal part of flagellum, from below.

Fig. 14. Endopod of one of the anterior legs.

Fig. 15. Endopod of a leg of last pair.

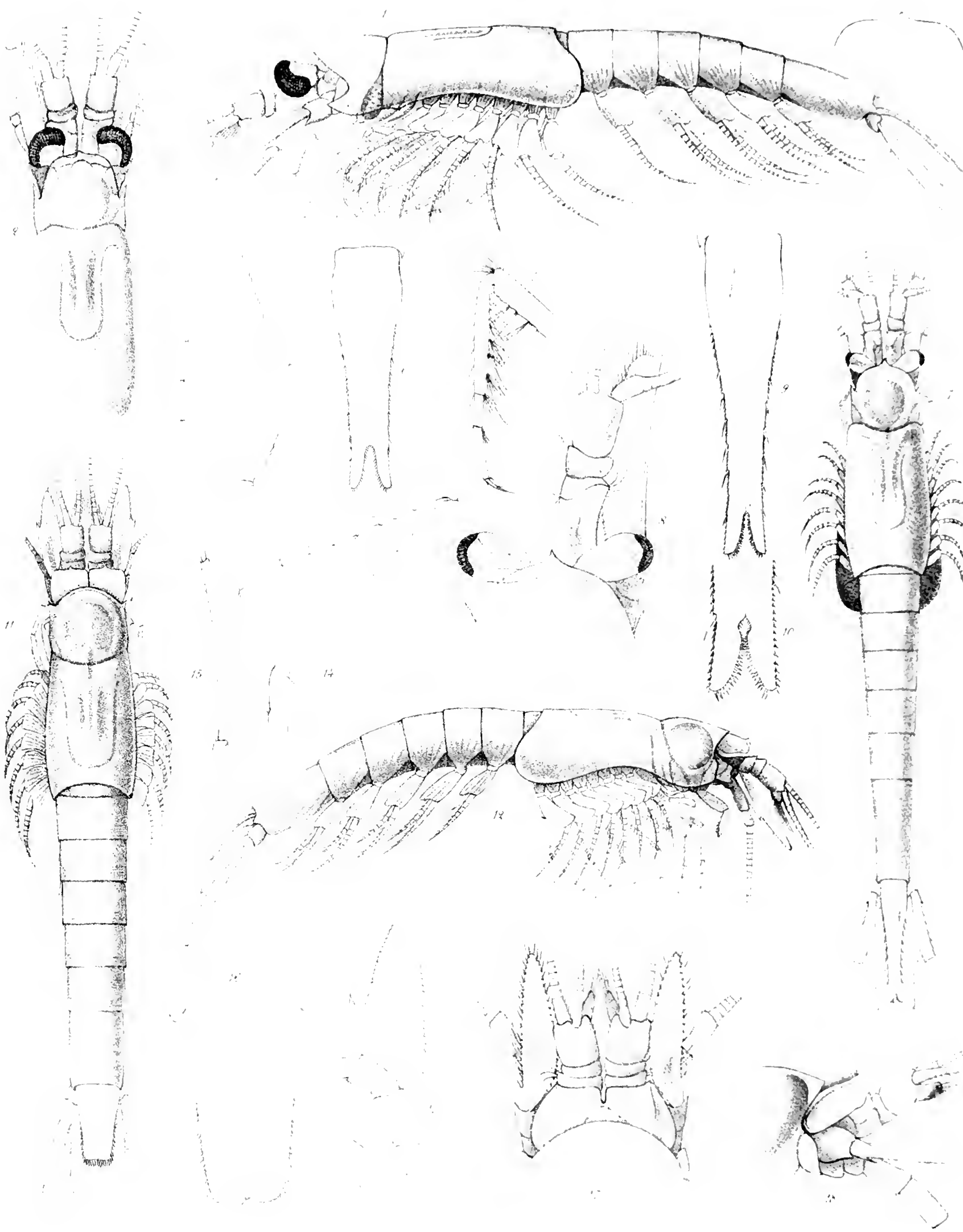
Fig. 16. Telson, from above.

Figs. 17–18. *Pseudomma australe*,[1] G. O. Sars.

Fig. 17. Anterior part of body of a male specimen, from above; highly magnified.

Fig. 18. Same part, from right side.

[1] *Amblyops* by mistake on the plate.



Figs. 1-6 BOREOMYSIS OBTUSATA, Figs. 11-16 AMBLYOPS CROZETII

7-10, MICROPS 17-18, AUSTRALIS,

PLATE XXXIV.

PLATE XXXIV.

Figs. 1–3. *Pseudomma sarsii*, Willemoes-Suhm MS.

Fig. 1. Adult male, from above; magnified about ten times.

Fig. 2. Antennal scale.

Fig. 3. Telson, from above.

Figs. 4–27. *Anchialus typicus*, Kröyer.

Fig. 4. Adult ovigerous female, from right side; magnified about twelve times.

Fig. 5. Same, from above.

Fig. 6. Adult male, from left side.

Fig. 7. Frontal part of carapace, with rostral projection, from above.

Fig. 8. Right antennular peduncle of male, from below.

Fig. 9. Left antenna, with scale and proximal part of flagellum, from above.

Fig. 10. Anterior lip.

Fig. 11. Posterior lip.

Fig. 12. Mandible, with palp.

Fig. 13. Cutting edges of mandibles.

Fig. 14. Maxilla of first pair.

Fig. 15. Maxilla of second pair.

Fig. 16. Maxilliped.

Fig. 17. Male gnathopod.

Fig. 18. Leg of first pair of male.

Fig. 19. Leg of second pair.

Fig. 20. Outer part of a leg of last pair.

Fig. 21. Male sexual appendage.

Fig. 22. Anterior part of tail of female, viewed from the ventral face, to show the two anterior pairs of caudal limbs and the epimera of first segment.

Fig. 23. Male pleopod of first pair.

Fig. 24. Male pleopod of fourth pair.

Fig. 25. Extremity of outer branch of same pleopod; more highly magnified.

Fig. 26. Telson, from above.

Fig. 27. Right uropod, from above.

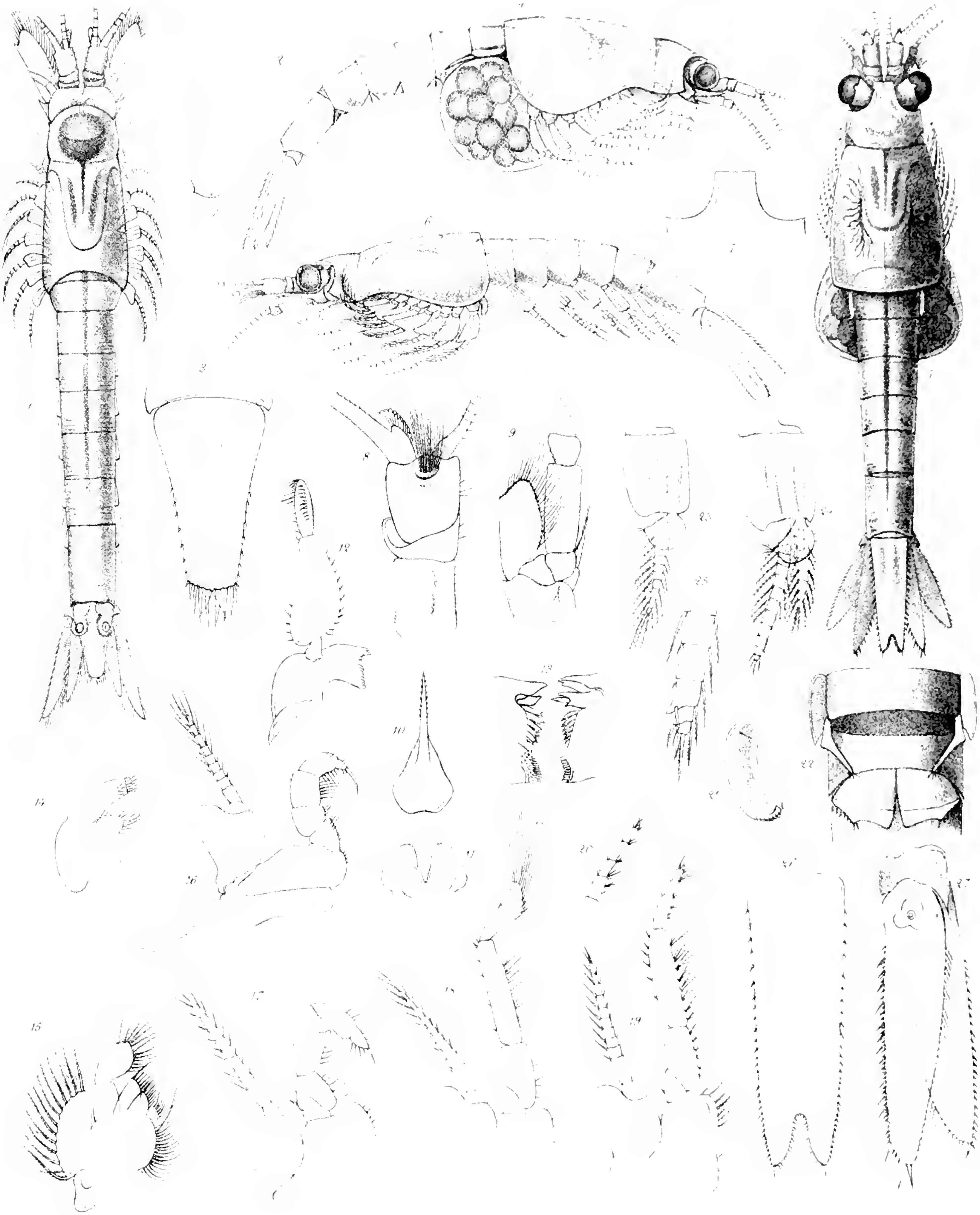


Fig. 1-3 PSEUDOMMA SARSII, Willem-Suhm MS
4-7 ANCHIALUS TYPICUS Krøyer

PLATE XXXV.

PLATE XXXV.

Figs. 1–18. *Anchialus angustus*, G. O. Sars.

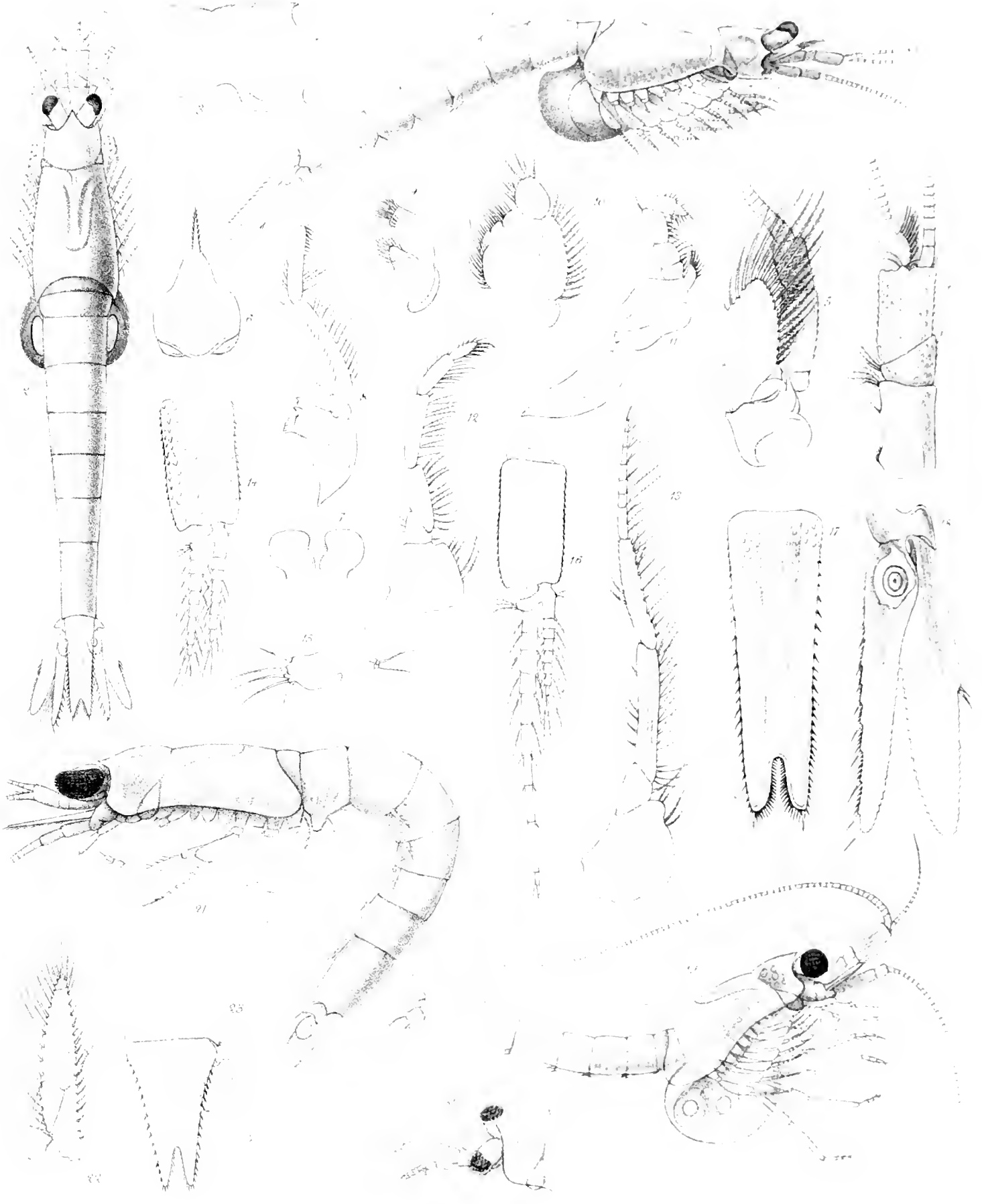
Fig. 1. Adult female, from right side; magnified about fourteen times.
Fig. 2. Same, from above.
Fig. 3. Anterior part of carapace, from right side.
Fig. 4. Left antennular peduncle of male, from above.
Fig. 5. Left antenna, with scale and proximal part of flagellum, from above.
Fig. 6. Anterior lip.
Fig. 7. Posterior lip.
Fig. 8. Mandible, with palp.
Fig. 9. Maxilla of first pair.
Fig. 10. Maxilla of second pair.
Fig. 11. Maxilliped (exopodite omitted).
Fig. 12. Male gnathopod (exopod omitted).
Fig. 13. Endopod of a leg.
Fig. 14. Male pleopod of second pair.
Fig. 15. Basal expansion of inner branch of same pleopod, more highly magnified.
Fig. 16. Male pleopod of fourth pair.
Fig. 17. Telson, from above.
Fig. 18. Right uropod, from above.

Figs. 19, 20. *Anchialus pusillus*, G. O. Sars.

Fig. 19. Adult female, from right side; highly magnified.
Fig. 20. Anterior part of body of another female specimen, obliquely from above.

Figs. 21–23. *Mysidopsis incisa*, G. O. Sars.

Fig. 21. Adult female, from left side; magnified about twenty times.
Fig. 22. Right antenna, with scale and proximal part of flagellum, from above.
Fig. 23. Extremity of tail, with telson and basal portion of right uropod, from above.



Figs 1-18 ANCHIALUS ANGUSTUS n sp Figs 19-20, ANCHIALUS PUSILLUS, n sp
Figs 21-23 MYSIDOPSIS INCISA n sp

PLATE XXXVI.

PLATE XXXVI.

Figs. 1–24. *Siriella thompsonii*, Milne-Edwards.

Fig. 1. Adult male, from left side ; magnified about fourteen times.

Fig. 2. Adult female, from right side.

Fig. 3. Same, from above.

Fig. 4. Left antennular peduncle of male, with the hispid lobe, from inner side.

Fig. 5. Outer part of same peduncle, from below ; more highly magnified. The hairs have been removed from the male appendage to show the double band giving origin to the hairs.

Fig. 6. Left antennæ, with scale and proximal part of flagellum, from below.

Fig. 7. Anterior lip and mandibles, from below.

Fig. 8. Terminal joint of mandibular palp ; more highly magnified.

Fig. 9. Cutting edges of mandibles.

Fig. 10. Maxilla of first pair.

Fig. 11. Maxilla of second pair.

Fig. 12. Maxilliped.

Fig. 13. Gnathopod.

Fig. 14. One of the anterior legs ; somewhat less magnified.

Fig. 15. Outer part of same ; more highly magnified.

Fig. 16. Leg of last pair, with male sexual appendage.

Fig. 17. Male sexual appendage, isolated, and more highly magnified.

Fig. 18. Male pleopod of first pair.

Fig. 19. Male pleopod of second pair.

Fig. 20. Branchial lobe of a pleopod of first pair.

Fig. 21. Branchial lobe of a pleopod of second pair.

Fig. 22. Telson, from above.

Fig. 23. Extremity of same ; more highly magnified.

Fig. 24. Right uropod, from above.

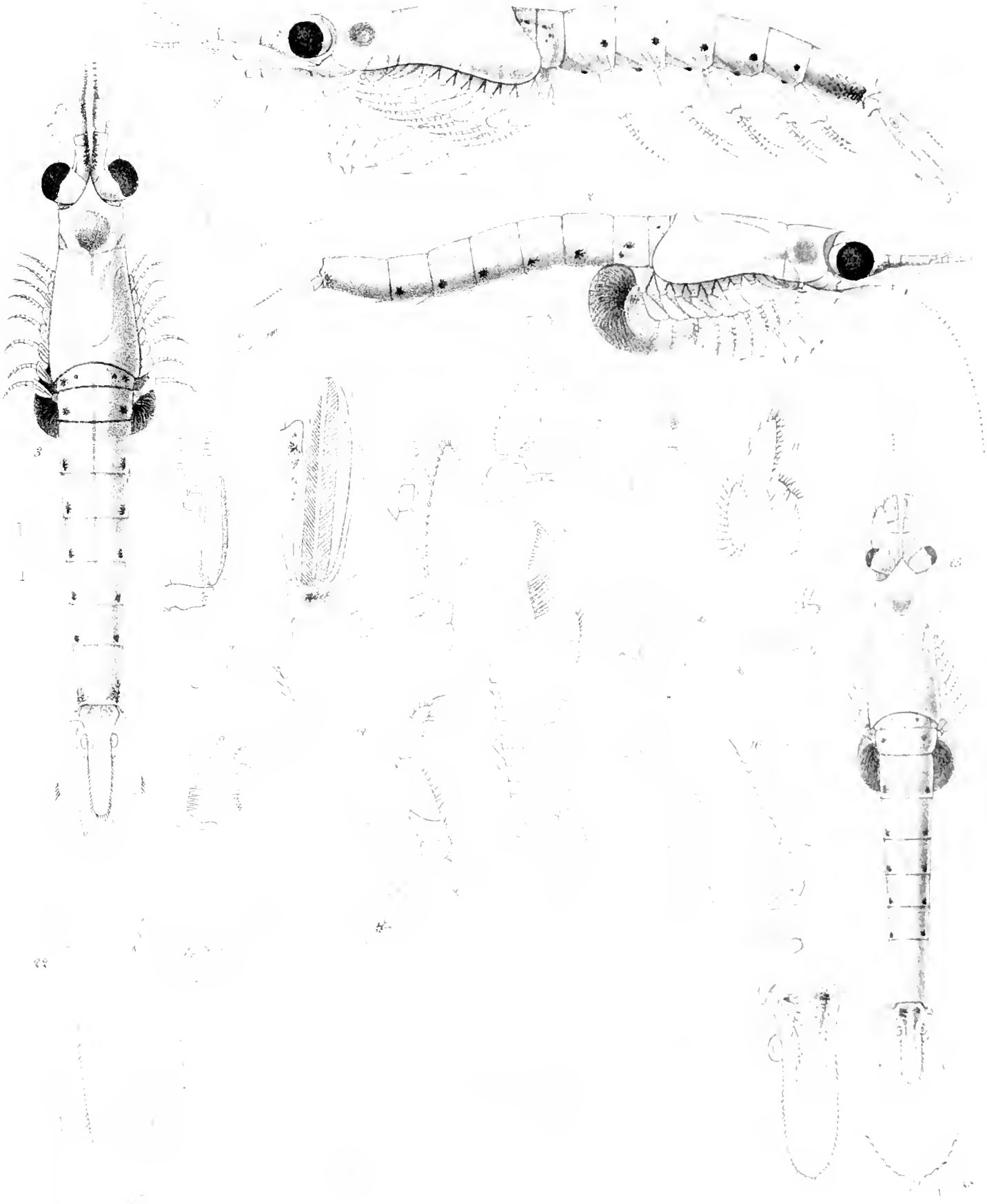
Figs. 25–28. *Siriella gracilis*, Dana.

Fig. 25. Adult female, from above ; magnified about twenty times.

Fig. 26. Right antenna, with scale and proximal part of flagellum, from below.

Fig. 27. Extremity of tail, with telson and left uropod, from above.

Fig. 28. Tip of telson ; more highly magnified.



Figs 1-24 SIRIELLA THOMPSONII
„ 25-28. „ GRACILIS Dana

PLATE XXXVII.

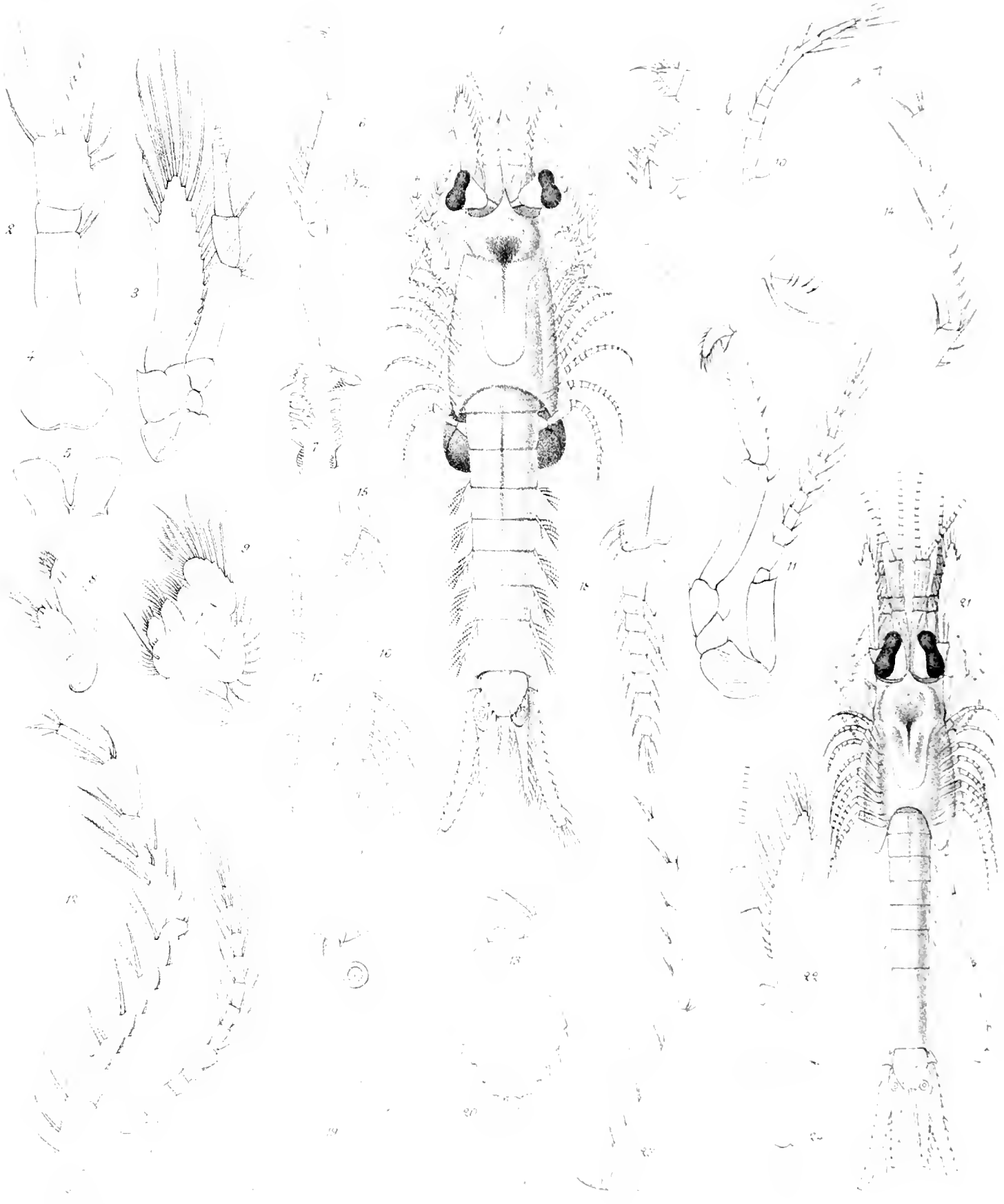
PLATE XXXVII.

Figs. 1–20. *Euchætomera typica*, G. O. Sars.

Fig. 1. Adult female, from above; magnified about eleven times.
Fig. 2. Right antennular peduncle, from above.
Fig. 3. Left antenna, with scale and proximal part of flagellum, from above
Fig. 4. Anterior lip.
Fig. 5. Posterior lip.
Fig. 6. Mandible, with palp.
Fig. 7. Cutting edges of mandibles.
Fig. 8. Maxilla of first pair.
Fig. 9. Maxilla of second pair.
Fig. 10. Maxilliped.
Fig. 11. Gnathopod.
Fig. 12. Leg of first pair.
Fig. 13. Extremity of same; more highly magnified.
Fig. 14. Outer part of a leg of last pair.
Fig. 15. Caudal limb of first pair of female.
Fig. 16. Caudal limb of last pair of female.
Fig. 17. One of the marginal setæ of same; highly magnified
Fig. 18. Male pleopod of first pair.
Fig. 19. Left uropod, from above.
Fig. 20. Telson, from above.

Figs. 21–24. *Euchætomera tenuis*, G. O. Sars.

Fig. 21. Female, from above; magnified about fifteen times.
Fig. 22. Right antenna, with scale and proximal part of flagellum, from above
Fig. 23. Endopod of a leg.
Fig. 24. Telson, from above.



Figs. 1-20, EUCHÆTOMERA TYPICA, n. gen. & sp.
21-24, " TENUIS, n. sp.

PLATE XXXVIII.

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Figs. 1–7. *Heteromysis bermudensis*, n. sp.

Fig. 1. Adult female, from right side; magnified about eighteen times.

Fig. 2. Same, from above.

Fig. 3. Left antennular peduncle, from above.

Fig. 4. Antennal scale.

Fig. 5. Telson, from above.

Fig. 6. Young, in pupa-stage, extracted from the marsupial pouch, and viewed from right side; highly magnified.

Fig. 7. Same, from below.

Figs. 8–14. *Ecto-Parasites of Schizopoda.*

Fig. 8. *Heterophryxus appendiculatus*, n. gen. et sp., affixed to the dorsal face of a specimen of *Euphausia pellucida;* lateral view. *a*, female; *b*, male.

Fig. 9. *Notophryxus lateralis*, n. sp. (*a*), affixed to base of penultimate gill of a specimen of *Nematoscelis megalops;* lateral view.

Fig. 10. Same parasite together with male (*a*), from below; more highly magnified.

Fig. 11. *Notophryxus globularis*, n. sp. (*a*), affixed to the posterior part of the dorsal face of carapace in a specimen of *Thysanoëssa gregaria;* lateral view.

Fig. 12. *Dajus siriellæ*, n. sp., female, with male (*a*) affixed, viewed from above; highly magnified.

Fig. 13. Same (female and male), from below.

Fig. 14. Male, isolated and viewed from above; more highly magnified.

Figs. 15–23. *Endo-Parasites of Schizopoda.*

Fig. 15. *Echinorhynchus corrugatus*, n. sp., lying within the perivisceral cavity of a specimen of *Euphausia pellucida;* lateral view.

Fig. 16. Same, isolated, and more highly magnified.

Fig. 17. Anterior extremity of same, with proboscis protruded.

Fig. 18. One of the hooks from the proboscis; highly magnified.

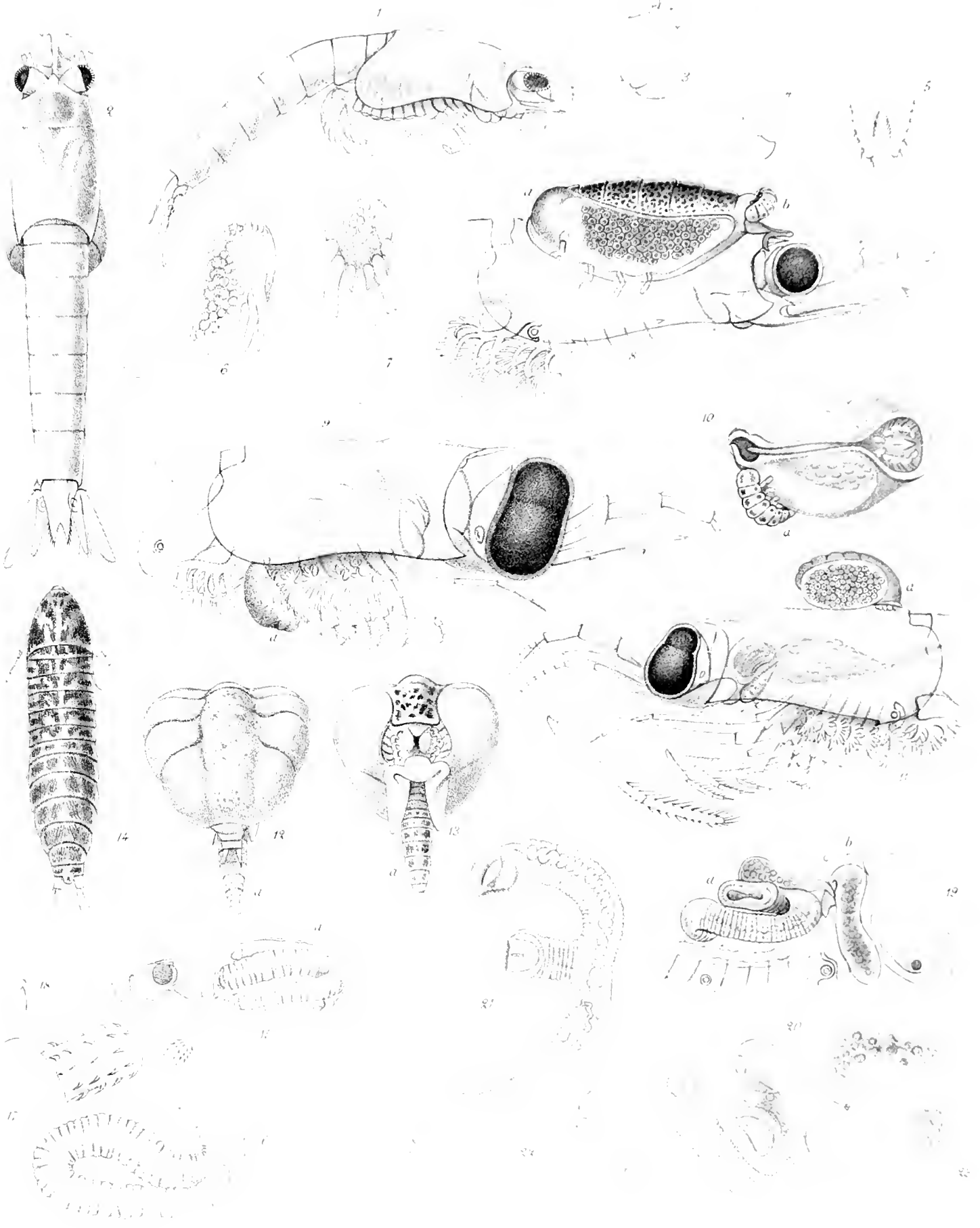
Fig. 19. *Distomum filiferum*, Leuckart, M.S., attached within the perivisceral cavity of a specimen of *Nematoscelis megalops;* lateral view.

Fig. 20. A specimen of the parasite, together with the sac-like body, isolated, and viewed from below.

Fig. 21. Another specimen, with the byssus thread exserted, from left side.

Fig. 22. Fragment of a byssus thread together with a number of fine adhesive fibres; highly magnified.

Fig. 23. A packet of adhesive fibres.



Figs. 1–7. HETEROMYSIS BERMUDENSIS n. sp.
823 ECTO- & ENTO-PARASITES on Schizopoda